User manual

EF

EF/B

English Version 10.0
(valid for software V4.9 and higher)

Series EuroFlow,
Type EF
Biological Safety Cabinet Class II
&
Type EF/B
Biological Safety Cabinet Class II

Types:

EF 4
EF 5
EF 6
EF/B 4
EF/B 6

Offers protection for personnel, environment and product.

Before using the safety cabinet, please read this manual carefully. The required instructions have to be carried out first.

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Preface

Congratulations with your new biological safety cabinet Class II, Series EuroFlow, type EF and/or type EF/B. This Dutch quality product is designed, produced and tested by Clean Air Techniek B.V., in our production facility in Woerden, The Netherlands.

The primary function of the safety cabinet is safety for operator, product and environment. Basic principle of the design are the latest standards regarding biological safety. Type EF meets all the latest requirements, including the European standard EN 12469:2000 for Microbiological Safety Cabinets. Type EF/B meets all the latest requirements, including the European standard EN 12469:2000 for Microbiological Safety Cabinets and DIN 12980:2005-06 for Safety Cabinets for cytotoxics.

The standards EN 12469:2000 and DIN 12980:2005-06 describe only the minimum requirements. They serve as the base for the high demands Clean Air Techniek B.V. pursuits for its products. Type EF and type EF/B are high quality products, constructed with high grade components and materials.

Besides providing biological safety, the wishes and demands of the operators have been important basic principles for the design. Examples are ergonomics, design and usability.

The above-mentioned motivations have resulted in the most progressive safety cabinets currently available, known for their superior quality, reliable performance, solid construction and many available options, accessories, related products and the possibility to incorporate weighing systems, microscopes etc or even build completely custom made cabinets. Furthermore, type EF and EF/B are service friendly installations.

The safety cabinet is equipped with new techniques, such as:

- Microprocessor control with a LCD display for the interface with the operator
- Automatic up speeding fan; when the filter resistance increases, the necessary airspeeds are maintained
- Window construction with a user-friendly hinge mechanism

We thank you for buying this cabinet and wish you good times working with the biological safety cabinet class II type EF and/or type EF/B. For questions, advice, training, validation, service and product adjustments please contact us.

Clean Air Techniek B.V.

Version table

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Clean Air Techniek B.V. is entitled to change parts on each desired moment, without preceding or direct notification of the customer. The content of this user manual can be changed without preceding warning as well. For information concerning maintenance activities or repairs which are not mentioned in the user manual, please contact the service organization.

This user manual has been put together with all possible care, but Clean Air Techniek B.V. cannot take the responsibility for possible mistakes in this user manual or for the consequences of it.

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1 Introduction

1.1 EF

The EF is a class II Biological Safety Cabinet. It gives the user the possibility to work safely and sterile with bioagentia without complete physical barrier between person and experiment (through work opening (C)).

- Working surface (A) is kept clear of particles by means of a clean downflow of air.
- Because of the downflow air passed through a HEPA filter (High Efficiency Particulate Air), the working area of the cabinet is free of particles.
- This airflow is laminar, the airflow has got no turbulence and has got a constant air speed.
- Through the work opening (C) air is drawn into the workspace (inflow), towards the front slots of the worktop. This protects the personnel against pathogenic aerosols that might be released.
- The downflow and inflow air is then drawn through a pre-filter (B) by a fan (E). This fan blows the air in the correct proportion to the downflow HEPA filter (D) and the exhaust HEPA filter (F).
- The extracted air of the cabinet can recirculate into the laboratory or can be blown into an exhaust channel.

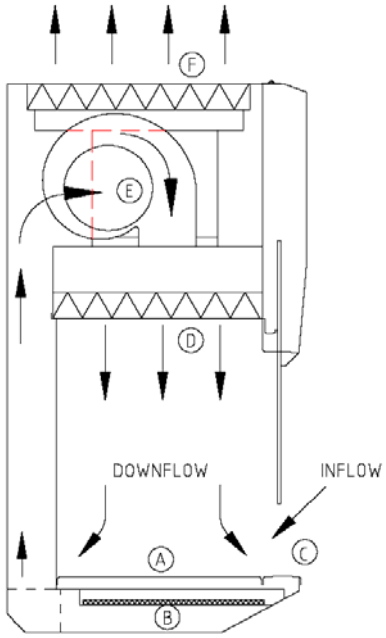


Figure 1 Sectional view EF

1.2 EF/B

The EF/B is a class II Biological Safety Cabinet. It gives the user the possibility to work safely and sterile with bioagentia without complete physical barrier between person and experiment (through work opening (C)).

- Working surface (A) is kept clear of particles by means of a clean downflow of air.
- Because of the downflow air passed through a HEPA filter (High Efficiency Particulate Air), the working area of the cabinet is free of particles.
- This airflow is laminar, the airflow has got no turbulence and has got a constant air speed.
- Through the work opening (C) air is drawn into the workspace (inflow), towards the front slots of the worktop. This protects the personnel against pathogenic aerosols that might be released.
- The downflow and inflow air is then drawn through a pre-filter (B) and a V-shaped HEPA filter (G) by a fan (E), mounted on a plenum construction. This fan blows the air in the correct proportion to the downflow HEPA filter (D) and the exhaust HEPA filter (F).
- The extracted air of the cabinet can recirculate into the laboratory or can be blown into an exhaust channel.
- In case the cabinet is used for cytostatics production, the cabinet has to be connected to an external exhaust channel.

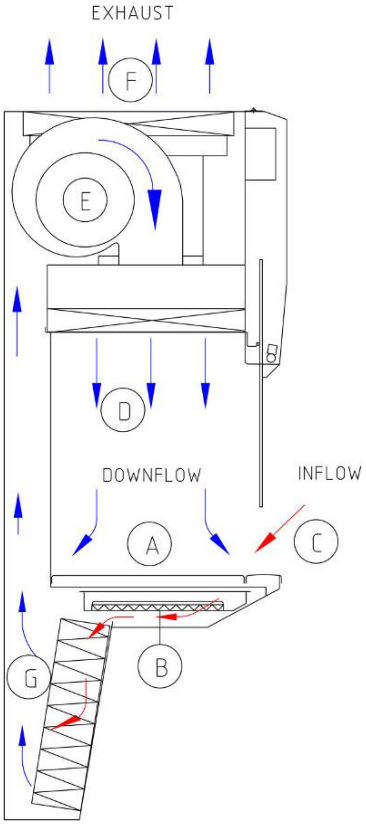


Figure 2 Sectional view EF/B

2 Safety

2.1 Use in conformity with regulations

Personnel that is not properly informed about the safety regulation and/or does not meet the requirements mentioned in *§2.3 Authorized persons*, is not allowed to use the cabinet. Improper use of the cabinet is not allowed.

2.2 Modifications and changes to the installation

In order to operate the installation safely changes and/or alterations shall only be made by Clean Air Techniek B.V., or shall be made after consultation with and permission in writing from Clean Air Techniek. If modifications and changes are made on own initiative, without permission from Clean Air Techniek B.V., the parts of the installation concerned are no longer covered by the warranty. Clean Air Techniek B.V. cannot be held liable for the consequences of the modifications and the dangers, which might possibly occur as a result. The modifications mentioned here include the connection of the installation to an exhaust system.

2.3 Authorized persons

Operating the installation

The cabinet shall only be used by personnel which:
- is familiar with the content, regulations and warnings which are mentioned in this operating manual;
- is familiar with how to operate the cabinet;
- is familiar with the start up procedure, the stop procedure and Knows how to react in case of emergency;
- is familiar with the regulations to keep the safety in all circumstances;
- is capable to end a disturbance.

Maintenance and repair general

Maintenance shall only be performed by professional service engineers, who are sufficiently trained by Clean Air Techniek B.V. to:
- Estimate and avoid the dangers of the installation;
- Estimate the consequences of their actions.
- Before starting maintenance to the installation (mechanical and/or electric) disconnect the power supply. Pay attention to rotating parts, after switching off the installation the fans will still rotate for a while.

Maintenance and repair of the electrical installation

Maintenance shall only be performed by professional electro-technical service engineers, who are sufficiently trained by Clean Air Techniek B.V. when:
- They can estimate and avoid the dangers of the installation;
- They can estimate the consequences of their actions;

- They are sufficiently informed about the operation of the installation and the operation of the sub-systems.

2.4 General safety aspects

1. The installation shall never be used for any (micro-) biological or any other potentially dangerous work, unless the fan is switched into working mode, the sliding window is in working position and there is no alarm.

2. It is strongly advised not to slide the window out of the working position, during working with the installation. When it is necessary to increase the work opening, this interruption needs to be as short as possible.

3. When the installation is not used, the window shall always be closed, with the fan off, or switched onto power-save mode, to prevent that dust particles etc. from the room can get into the installation (or worse: material from the installation can get into the room).

4. Always try to limit the amount of equipment in the workspace. Each object in the workspace will disturb the pattern of the airflow and a large number of equipment may lead to serious disruptions.

5. Materials such as Petri dishes or tissues should, during activities, never cover the slots of the worktop, since no protection of the personnel can be guaranteed.

6. Do not use a centrifuge in the workspace. Even a small centrifuge is large in comparison with the work surface and its presence may seriously disrupt the airflow. In addition, all centrifuges themselves create an airflow, which may fling particles out of the casing.

7. When homogenizers are used in the installation, all reservoirs have to be secured by screw connections, so that a sudden emission of fluids or aerosols will be avoided. To protect the personnel, glass reservoirs are suitable for protection. High-speed homogenizers may cause air turbulence, as do centrifuges.

8. Even with the best technology, there may still be a risk that the hands and arms of the personnel get contaminated during the work. Movements shall be kept to a minimum. Protective clothing shall have tightly fitting cuffs. The use of hand gloves and over sleeves is recommended.

9. Always use a chair with the correct height. This enables the personnel to have a good view through the sliding window. User should sit in such a position, that looking under the edge of the sliding window during the work is not possible.

10. It is important to keep the biological safety cabinet clean. Minor contaminations are not always immediately visible and could easily be forgotten. This increases the possibility that potentially infective material is left behind and may cause serious contamination of the interior of the installation or worse. Regularly clean the worktop, the bottom side, as well as the space under the worktop, in particular. In case of doubt consider disinfection or contact Clean Air Techniek B.V. about the possibilities.

11. Transport and installation of the cabinet is only allowed for authorized staff. Please contact the manufacturer or the seller of the products.

2.5 Cytotoxic danger (EF/B only)

Before starting work in cytotoxics production the hazard risks of cytotoxics handling need to be evaluated and documented (industrial safety act, hazardous substances regulations). Based on these findings the employees must be instructed.

2.6 Explanation user safety symbols

	GENERAL DANGER You can harm yourself and others seriously if you do not follow the procedures carefully.
	DANGER FOR ELECTROCUTION
	BIOLOGICAL DANGER
	DANGER OF EXPLOSION
	DANGER BY INDUSTRIAL VEHICLE
	CYTOTOXIC DANGER

3 Installation

	GENERAL DANGER Be careful: high centre of gravity, crossover point. Never hinge the window, as long as the cabinet is not placed on the support frame

The cabinet must be installed in a safe way. Clean Air Techniek B.V. supplies an optional support frame, which is designed for this purpose.
When the cabinet is purchased without a support frame, it is advised to discuss the installation with the supplier.

3.1 Assembly-instruction

The cabinet has to be placed on the support frame recommended by the supplier. The assembly needs to be done as specified in instruction underneath.

Assembly support frame

Build the support frame (see *Appendix I: Support frames EF & EF/B on page 66* for an explaining drawing):

- Mount the support yoke (Pos. 1) to the reinforcement plate (Pos. 3);
- Mount (optional) feet support (Pos. 2).
- Item no. 6 is used to position the cabinet to the support frame (see *§3.1 Placing the cabinet on page 11*).

Placing the cabinet

- Place the cabinet right on the forks of a forklift truck or lifting platform;

	DANGER BY INDUSTRIAL VEHICLE Be careful: Make sure the cabinet cannot slide from the forks.

- Move the cabinet to the correct height and position, perform this action as precise as possible above the support frame;
- The weight must be equally divided between the both forks and the cabinet must be horizontal levelled;
- The cabinet should be aligned with the covers of the support frame.
  The two cones on top of the yokes will help aligning;
- Mount the cabinet to the support frame by means of the four inner hexagonal cylinder screws M8x12 (Pos. 6). See *Appendix I: Support frames EF & EF/B on page 66*;
- Connect the wire to a grounded socket that is easy accessible.

In case of maintenance the cabinet must be completely free of voltage. This means that the connector in the socket must be easy to reach, otherwise a main-switch must be mounted between the cabinet and the power supply so that the cabinet can be cut off of the power-circuit.

3.2 Transport instructions

- Before moving the cabinet make sure the power cable is disconnected of the power supply
- The cabinet must be transported on a strong solid pallet.
- After every transport the cabinet must be tested and calibrated.

	GENERAL DANGER Be careful: High center of gravity, crossover point.

3.3 Dismantling & Disposal

For dismantling and disposal follow the next instructions:

- See *§7.1 Cleaning the installation on page 51;*
- See *§8.2 Replacement of the pre-filter on page 56*;
- See *Appendix II: Disinfection on page 67;*
- See *Appendix III: Replacement of the HEPA filters on page 68;*
- Break the unit down into its component parts. You can re-cycle these components parts, dispose them in accordance with local requirements.

For advice or information about dismantling or disposal please contact Clean Air Techniek B.V.

4 Product description

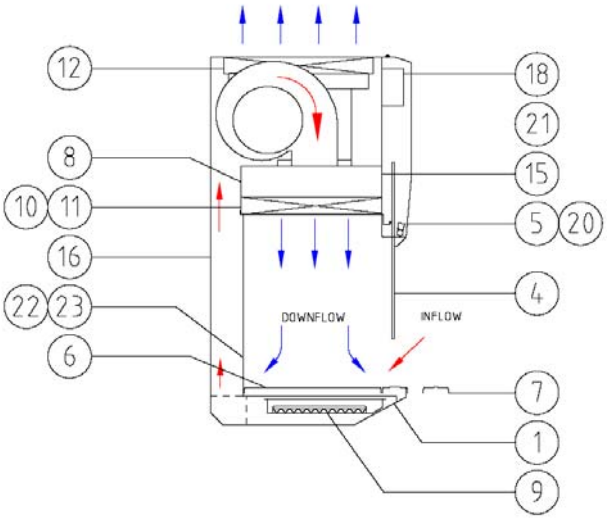


Figure 3 Sectional view EF

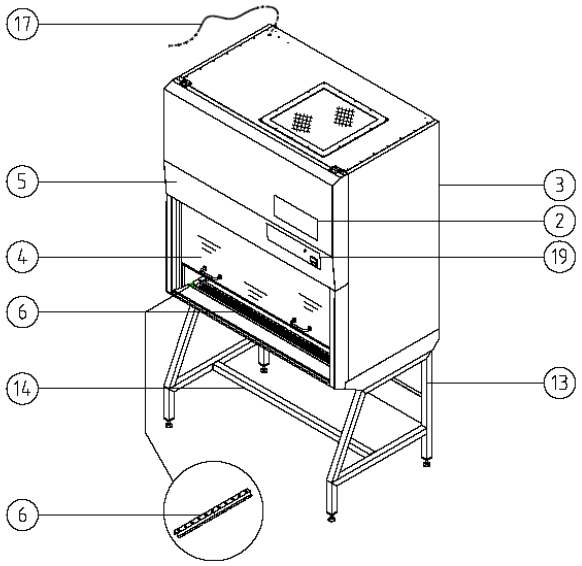


Figure 4 3D view EF

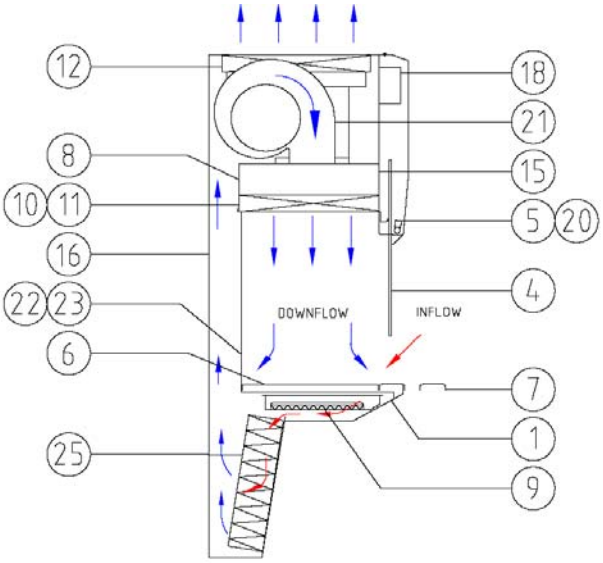


Figure 5 Sectional view EF/B

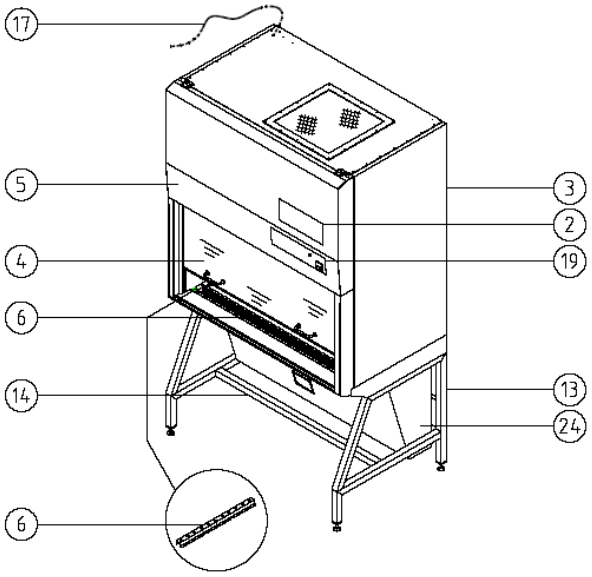


Figure 6 3D view EF/B

Part list EF and EF/B

1 Type plate
2 Short user manual
3 Body of the cabinet
4 Hinge/slide window
5 Top hood
6 Worktop
7 Aerofoil
8 Plenum-construction
9 Drip tray/pre-filter
10 Downflow filter
11 Downflow protection (build in)
12 Exhaust filter
13 Support frame (optional)
14 Feet support
15 Front panel
16 Back panel
17 Mains connection
18 Electronics
19 Operating panel
20 Lightning
21 Fan
22 Optional fittings
23 Sockets

EF/B only:

24 Housing of first HEPA filter
25 First HEPA filter

4.1 Type plate

The type plate (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 1) mentions instructions that are important for the connection of the biological safety cabinet. See *Appendix VIII: Stickers on page 81*.

4.2 Short user manual (sticker)

The short user manual (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 2) gives a brief overview of the primary functions, and is included with the cabinet. See also *Appendix XIII: Short user manual on page 93*.

4.3 Body of the cabinet

The body of the installation (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 3) is made of epoxy-coated steel. The interior of the body is made of stainless steel (304). The body is leak tight as per LI-C (table 1 and 4 of the EN 12469:2000-standard). The body has been tested according to the method described in annex 2 of the EN 12469:2000.

4.4 Hinge-slide window

The hinge-slide window (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 4) is a tightly closing, manually operated glass window. It can be slid up or down, and opened and closed by means of handgrips. The window construction contains two guiding profiles with a compression spring. The spring will push a ball into a hole in the guiding shaft when the window enters the working position (this working position is also indicated by means of two blue indication stickers).
The window can be hinged, but only in the hinge position, the top hood has to be opened first. See *§5.2 Top hood/sliding window on page 23*. The hinge option offers the advantage that even larger objects can be placed inside the working space. It also makes cleaning the working space as well as the inside of the window easier(see *7.1 Cleaning the installation on page 51*).

4.5 Top hood

In and behind the top hood (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 5) a number of electrical components are assembled.

- FL lighting
- Operating panel / operating board
- Interface board, including engine control
- Additional option print.

If you wish to check one of these components, you need to hinge the top hood.
To check the interface board, the safety-cover has to be taken away (authorized service personnel only). Caution! Some of the components are live and therefore carry a risk of electrical shock as long as the mains plug is connected.

4.6 Worktop

The workroom contains a stainless steel (type 304) worktop (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 6) with a deepened work surface. This deepened work surface is called the safe working area (for information about the dimensions see *§9.2 General specifications on page 61)*. At the front and the back there are air slits, which are essential to the functioning of the installation. At the two sides two panels have been placed (See detail Pos. 6)

4.7 Aerofoil

The aerofoil (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 7) is used for a better air conduction and to support the elbow. During work with the cabinet the aerofoil needs to be installed. The aerofoil is made of coated aluminium for better ergonomics. (less weight and less heat transportation)

4.8 Plenum-construction

The plenum-construction (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 8) divides the air, which is let in by the fan, between the downflow HEPA filter and the exhaust HEPA filter.

4.9 Drip tray/pre-filter (only EF/B and as an option for the EF)

The pre-filter with drip tray (EF: *Figure 3* and EF/B: *Figure 5,* Pos. 9) is assembled under the worktop. The installation is equipped with this to protect the interior of the installation against pollution by coarse materials and to collect spilled fluids. Furthermore the pre-filter will enhance the life span of the HEPA filter significantly.

4.10 Downflow HEPA filter

The downflow HEPA filter (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 10) has a very high efficiency: Class H14 in accordance with EN1822. After assembling, each filter will be tested separately according to EN12469:2000, Annex D. Through the service panel the downflow filter can be reached (Pos. 15).

4.11 Downflow protection

The downflow filter has a build-in protection grid (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 11).

4.12 Exhaust HEPA filter

The exhaust HEPA filter (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 12) has a very high efficiency: Class H14 in accordance with EN1822. After assembling, each filter will be tested separately according to EN 12469:2000, Annex D. Through the topside of the cabinet the exhaust filter can be reached.

4.13 Support frame (optional)

For a stable positioning of the cabinet, we strongly recommend the use of the especially designed support frame from the supplier (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 13).
This support frame includes an in steps adjustable feet support for a good ergonomic work position (*Figure* 3*, Figure 4, Figure 5* and *Figure 6,* Pos. 14). As well, the feet support will increase the stability of the cabinet. In addition, it is recommended to use an in height adjustable, well disinfectable chair to optimize the work position.

4.14 Feet support (assembled on 4.13)

The support frame includes an in steps adjustable feet support for a good ergonomic work position (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 14). As well, the feet support will increase the stability of the cabinet. In addition, it is recommended to use an in height adjustable, well disinfectable chair to optimize the work position.

4.15 Front panel

The service panel (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 15) can be dismantled to get access to:

- the downflow filter;

- the fan.

		GENERAL DANGER / BIOLOGICAL DANGER Cabinet must be disinfected before removing the front panel

4.16 Back panel

The back panel (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 16) can be dismantled to get access to:
- optional fittings;
- sockets.

		GENERAL DANGER / BIOLOGICAL DANGER Cabinet must be disinfected before removing the back panel

4.17 Main power connection

The main power connection (Figure 3, Figure 4, Figure 5 and *Figure 6,* Pos. 17) is positioned on the top of the cabinet. The cord length is maximum 3 meters and should always be accessible. See *§9.2 General specifications on page 61* for details.

4.18 Electronics

The electronics (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 18) consist of:
- Operational print; positioned in the top hood behind the operating panel;
- Control print, positioned under the top hood, behind the safety-cover, including:
    - Fuse holders (see *§9.2 General specifications on page 61* for fuse-numbers).
    - Fan control. The control is free adjustable in the range between 0% and 100%
    - An Air velocity compensating microprocessor regulates the fan speed to compensate for main power fluctuations and filter pollution.
    - Independent potential free output contact (interface board connector J6). See *Interface board on page 78.*
    - Main filter
    - Light ballast + starter for UV (Option)
    - Light ballast for FL-light
    - Option board (see *Appendix* VI: Lay-out boards *on page 78*)

4.19 Operating panel

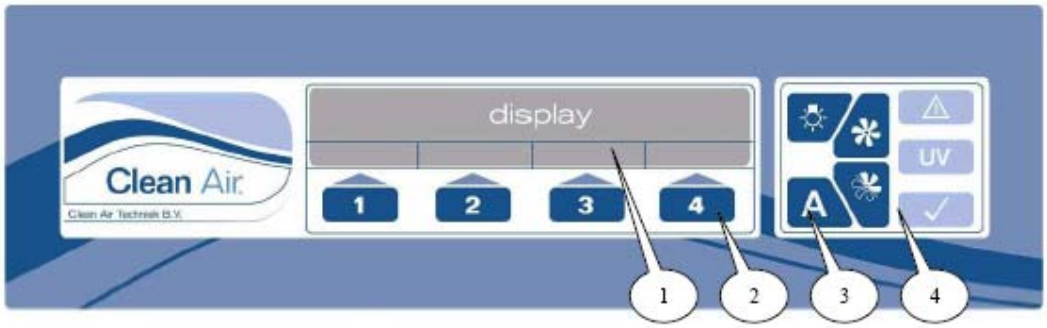


Figure 7 Operating panel

The operating panel (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 19 and *Figure 7*) consists of:

1. Display;
2. Function keys (4x);
3. Fixed keys (4x);
4. Signals.

4.20 FL-lighting

The Fluorescent-lighting (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 20) is assembled behind the top hood.

4.21 Fan

The fans with the motor (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 21) are maintenance-free, double suction fans. The "Air Velocity Compensating Microprocessor" controls the fan power for any disrupting factors such as voltage drops or filter pollution. With an installation with a double exhaust HEPA filter, an additional fan is built in. The fan regulations are mounted behind the light hood.

4.22 Optional Fittings

(*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 22)

Gas connection

This connection is assembled together with a gas valve. Normally, both the inlet and outlet gas connections are hose connections, suitable for hoses with an inner diameter of 10 mm. All connections on the gas supply have to be done with a certified gas hose.
After the connection on the gas supply, the gas connections have to be tested on leakage by a certified installer.

An electrical gas valve has to be assembled on the gas connection (see Annex A.9 of the EN 12469:2000 standard) as an extra safety precaution. A coupling via the electrical system of the

installation makes sure that the valve can only be operated in work mode and will be switched off automatically by leaving this mode.

The gas valve switch-function 4 is only visible when the fan in work mode is and there are no air speeds alarms.

Positions of the supply connection EF

- The connection, that is located inside the installation, is standard assembled on the back part inside the work space of the biological safety cabinet.
- The connection, that is located outside the installation, is standard assembled in the bottom of the installation.
- The connection, that is located outside the installation, can be assembled by customer request in left or right side panel or top of the installation.

Positions of the supply connection EF/B

- The connection, that is located inside the installation, is standard assembled on the back part inside the work space of the biological safety cabinet.
- The connection, that is located outside the installation, is standard assembled in the left or right side panel of the installation.
- The connection, that is located outside the installation, can be assembled by customer request in top of the installation. For EF/B-series assembly of this connection on the bottom is not possible.

Bunsen burner lead-through set

The Bunsen burner can be plugged into the outlet with a short cable inside the work space. The plug of the foot pedal can be inserted into an outlet. The Bunsen burner can only operate when the cabinet is in safe work mode and button 4 (Gas) is activated. Recommended to apply is the Fuego Bunsen burner, available at Clean Air Techniek B.V.

Positions of the supply connection EF

- The connection, that is located inside the installation, is standard assembled in the back panel of the workspace.
- The connection, that is located outside the installation, is standard assembled in the bottom of the installation.
- The connection, that is located outside the installation, can be assembled by customer request in left or right side panel or top of the installation.

Positions of the supply connection EF/B

- The connection, that is located inside the installation, is standard assembled in the back panel of the workspace.
- The connection, that is located outside the installation, is standard assembled in the left or right side panel of the installation.
- The connection, that is located outside the installation, can be assembled by customer request in top of the installation. For EF/B-series assembly of this connection on the bottom is not possible.

Vacuum connection

This connection is always assembled in combination with a vacuum tap.

Positions of the supply connection EF

- The connection, that is located inside the installation, is standard assembled in combination with a vacuum tap in the back panel of the workspace.

- The connection, that is located outside the installation, is standard assembled in the bottom of the installation.
- The connection, that is located outside the installation, can be assembled by customer request in left or right side panel or top of the installation.

Positions of the supply connection EF/B

- The connection, that is located inside the installation, is standard assembled in combination with a vacuum tap in the back panel of the workspace.
- The connection, that is located outside the installation, is standard assembled in the left or right side panel of the installation.
- The connection, that is located outside the installation, can be assembled by customer request in top of the installation. For EF/B-series assembly of this connection on the bottom is not possible.

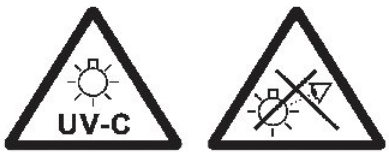
UV light

The UV light is meant for disinfection of the working surface of the safety cabinet.

When the UV light switches on, the FL lighting switches off. The UV light can only be switched on when the window is closed (window on aerofoil) or when the cabinet is in disinfection mode (aerofoil lifted up and window at its lowest point), this makes sure the user will not get in contact with UV-C radiation.

The UV switch-function

is only visible when the window is closed.

	DANGER FOR BURNING Avoid direct contact with UV-C radiation. This causes burns to the skin and eyes.
- DANGER - **UV-C** RADIATION PROTECT EYES AND SKIN 	

The UV light can be switched on and off on the display (see *§5.8 Control UV (optional) on page 29*). It is also possible to adjust the UV disinfection, for each day a certain disinfection period can be defined (see *§5.11 Set up 7 days clock UV on page 31)*.

Watch Out!	Do not touch the UV-lamp with the hand and keep the lamp fat free; otherwise the lifetime will decrease. The UV-light must be cleaned with alcohol (70%) regularly (switch off the installation). See *§7.2 Cleaning the UV-light (optional) on page 53.*

When the UV is switched on, the UV hour counter counts the lighting period. UV-lamps have, depending on fabricate and type, a limit in effective running hours. Replace the lamp frequently.

Alternative Options

Please contact Clean Air Techniek B.V. for information about alternative options.

4.23 Sockets

The sockets are assembled on the back wall of the working area (*Figure 3, Figure 4, Figure 5* and *Figure 6,* Pos. 22 and 23).
They can be operated at the control panel. See *§9.2 General specifications on page 61* for electrical details. The constructions of these may vary per country. When the Biological Safety Cabinet has been switched off, this function has to be activated each time, via the switch on the operating panel.

Please contact Clean Air Techniek B.V. for information about alternative options.

4.24 Housing of the first HEPA filter (EF/B only)

The EF/B has a number of V-shaped HEPA filters (*Figure 6,* Pos. 24). These filters (8 for the EF/B 4 and 12 for the EF/B 6) are mounted in a filter container underneath the working space.

4.25 First HEPA filters (EF/B only)

The EF/B has a number of V-shaped HEPA filters. These filters (8 for the EF/B 4 and 12 for the EF/B 6) are mounted in a filter container (*Figure 5*, Pos. 25) underneath the working space .

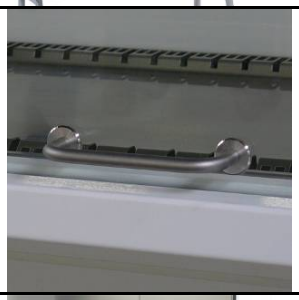
5 Control

5.1 Using the cabinet

Check if the information on the type plate is corresponding to the main power connection.
Connect the cabinet to the main connection by putting the plug into a grounded socket that is easy accessible.

5.2 Top hood/sliding window

The hinge/slide window can be in several positions, see *Figure 8 Window positions*.
The used example of the EF is also valid for the EF/B.

1		Hinged: Top hood is also open.
2		Disinfection position: Aerofoil is removed, window in lowest position.
3		Savings/UV/hinge-position: Window is closed on the aerofoil.
4		Working position: Safe work opening.

5		Top position: Maximum opening, to place objects in cabinet.

Figure 8 Window positions

Slide the window

To slide the window, both handles need to be used.
Note 1: When the window is not in the working position, the safety of the cabinet cannot be granted. This status will cause an alarm.

Hinge the window

The window construction can be hinged manually, for example when the working area and window need to be cleaned, but also for placing large objects in the working area.
The window can only be hinged when the window is slit downwards on the aerofoil and when the locking pins are locked (see Figure 12) and the swivel blocks are opened (see Figure 15).

Hinge the window open and closed

- Open the top hood up (see *Figure 9*, Pos. 1);
- Hinge both the side profiles open (see *Figure 9*, Pos. 2);
- Turn the locking pins which are mounted on the plastic, window slides 90 degrees (see Figure 12);
- Slide the window downwards (see *Figure 9*, Pos. 3) until it clicks in low position.

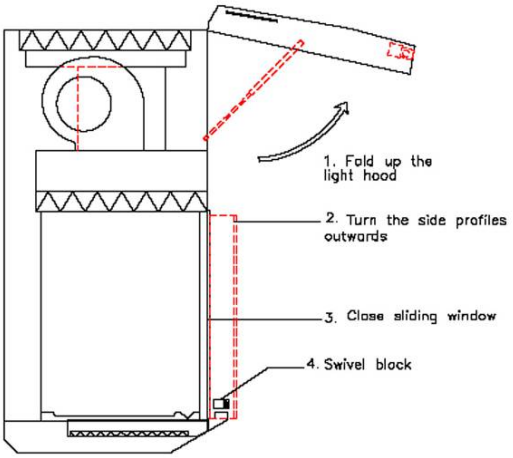


Figure 9 Hinge instructions

- Turn both the swivel blocks (See *Figure 10*, Pos. 5 en *Figure 15*) so that the recesses point forwards;

- Hinge (tilt) up the window (see *Figure 10,* Pos. 6) with the aid of the springs, it stays open on the maximum position please use both hands for lifting the window!

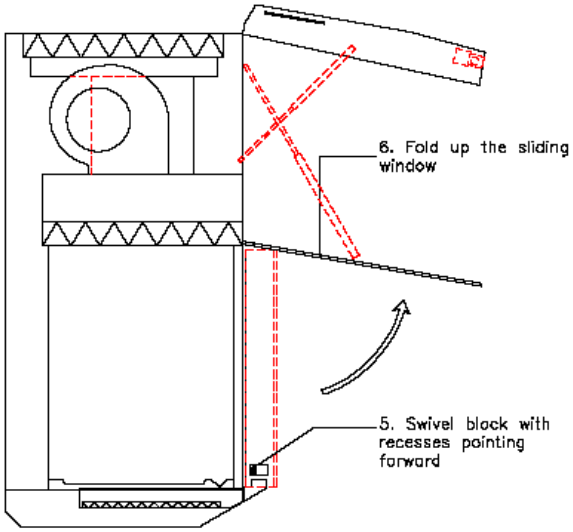


Figure 10 Hinge instructions

Figure 11 Locking pins

Figure 12 Hinge position

Figure 13 Slide position

Figure 14 Swivel blocks

Figure 15 Hinge position

Figure 16 Slide position

After hinge actions follow reverse procedure to close and slide the window. Only do not forget to pull both the locking pins out and turn 90 degrees (see *Figure 13*) and also position both the swivels in the slide positions (see *Figure 16*).

5.3 Display interface

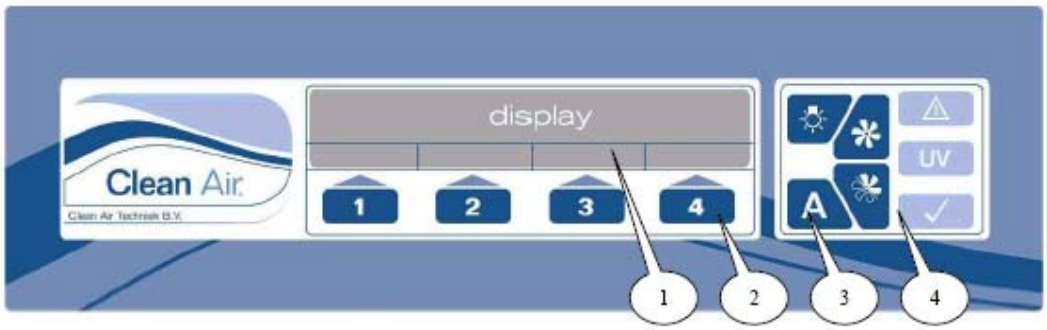


Figure 17 Display Interface

The operating panel (Figure 4 and Figure 6, Pos. 19 and *Figure 17*) consists of:

1. Display;
2. Function keys (4x);
3. Fixed keys (4x);
4. Signals.

Display:

The display has 4 lines, the lowest line gives the description of the function key underneath.

I	Cabinet switched off – not safe
II	Monday 11:06:33
III	
IV	MENU | Socket=Off | |

Fixed keys:

	Lighting ON/OFF
	Work mode fan ON/OFF
	Power save mode fan ON/OFF
A	Acknowledge / Enter

Function keys:

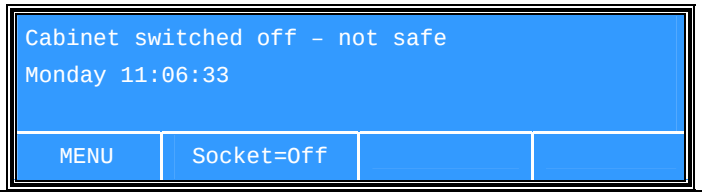
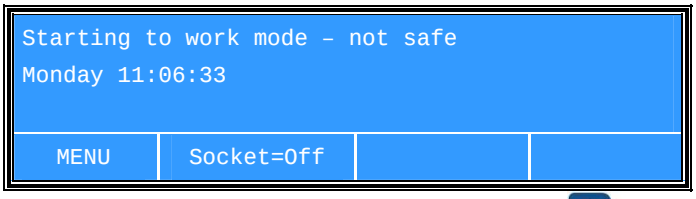
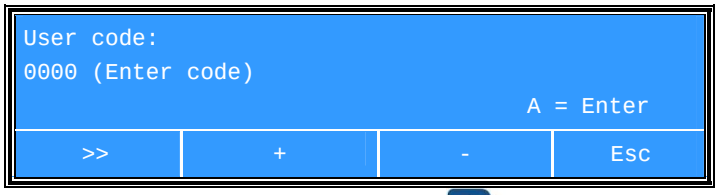
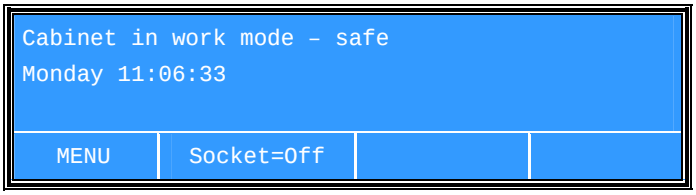
The function of keys 1, 2, 3 and 4 is variable. In the last line of the display the function is shown.

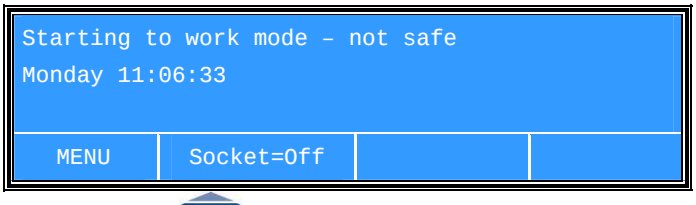
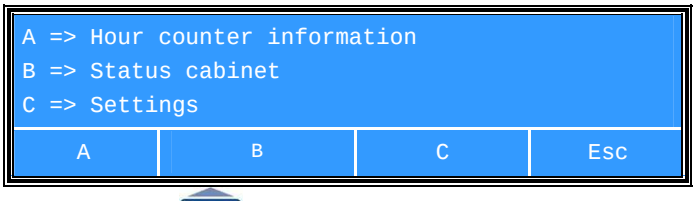
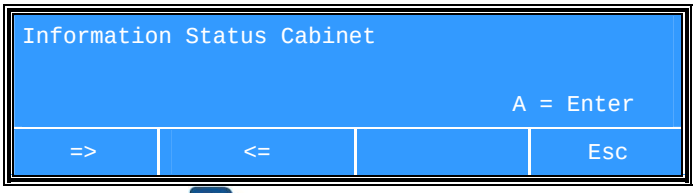
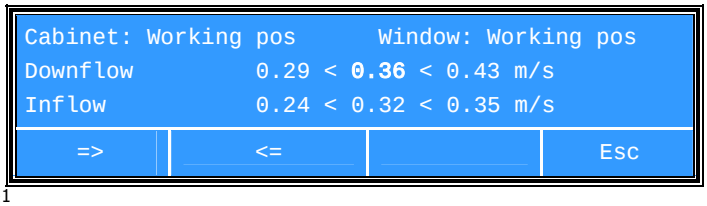
Signals:

⚠	Alarm: Confirmed alarm state Alarm, flashing (along with acoustic signal): Actual alarm
UV	UV: Indication UV-light switched on
✓	OK: Safe user mode

All equipment and, if possible, all materials required for working with a safety cabinet need to be placed into the installation before starting up the cabinet. Equipment or objects with a height up to 350 mm can be placed in the working space by sliding the window upwards. In case of larger objects the window can be hinged. Be careful: keep the safety regulations in consideration.

5.4 Starting up the cabinet

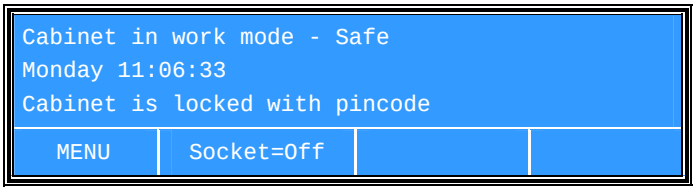
1	The lighting of the display will light up. The alarm indicator light is red ⚠.	• Connect the power cable. 
2	Use both handgrips when hinging or sliding the window.	• Put the window in the working position (see marks on the installation Workposition calibrated).
3	The fan starts. Cabinet is in start up mode. The alarm indicator light is red ⚠. There is an acoustic alarm.	• Push button ✻.  • To acknowledge this alarm, push button A.
4	If the cabinet is secured with a user code, this code has to be entered first. The default code is 0001. The user code can be changed by the user, see *Appendix X: User code on page 87.*	• Enter actual user code.  • Confirm the code with button A.
5	The light will switch on.	• Push button ☼.
6	When the fan has reached the right airspeed, the alarm indicator will disappear. The following display will be shown.	 However, the cabinet must operate for minimally 15 minutes more, before the cabinet is ready to work with.

7	If the air speeds still are not right, the alarm will sound again. To see what is wrong: See *§5.13 Information status cabinet on page 40* for more info about this menu.	 • Push button 1 (Menu).  • Push button 2 (B).  • Push button A.  *1 • Back to starting menu: button 4 (Esc).

*1 The average inflow velocity at the top of the front aperture is measured and can be read in the display. The minimal required value of the average inflow velocity measured at the top of the front aperture is given in chapter 9.2 on page 61. Measuring these most critical measured values directly under the window ensures that the overall average inflow velocity is according to the guidelines of the EN12469:2000 (Annex H table H1 Mean inflow velocity to achieve operator protection > 0,4 m/s).

5.5 Locking functions cabinet

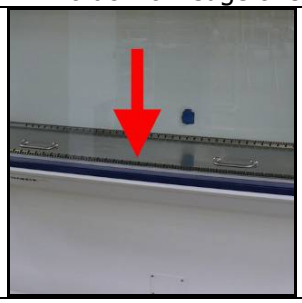
(Only when the locking function is activated)

1	The cabinet will lock its functions after being 5 minutes in work position. In the status of being locked, only a window alarm can be acknowledged.	When, within these 5 minutes, an arbitrary button is pushed (e.g. lighting) the timer starts counting again.
2	From this moment the fan-buttons are not available anymore. The user code has to be entered to make the functions available again.	 See *Appendix X: User code on page 87.*
3	If the cabinet has to be locked immediately after entering the	• Push button A for 5 seconds After 3 seconds, two short beeps will be heard as an

	code:	acknowledgement the cabinet has been locked.
4	To unlock the cabinet, the user code has to be entered again.	See *Appendix X: User code on page 87.*

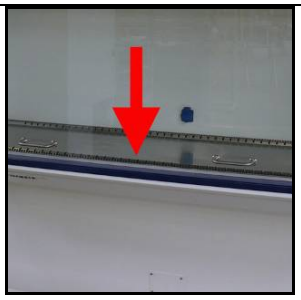
5.6 Power save mode

When not using the cabinet for a short period of time, put it in the power save mode. The fan will run at half speed to save energy (synonyms for power save mode are standby mode or night mode).

1	Power save mode The fan runs at half speed. There is an acoustic alarm.	• Push button . When the cabinet is locked enter the user code. Cabinet in power save mode – not safe Downflow to low + Inflow MENU | Socket=Off • To acknowledge this alarm push button A.
2	Slide down the window onto the aerofoil, to cease the alarm.	
3	Switch off procedure	• With the next push on the power save button the cabinet enters the switch off procedure. Cabinet switched off – Not Safe Monday 11:06:33 MENU | Socket=Off
4	Work mode	• Push button and slide the window back in working mode. Cabinet in work mode - Safe Monday 11:06:33 MENU | Socket=Off

5.7 Turn off

Remove all materials en accessories from the working area. Remove all spilled liquids and other parts in a responsible manner, according to the regulations.

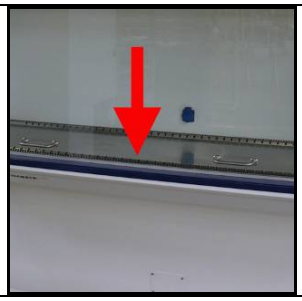
1	The alarm indicator becomes red and there is an acoustic alarm.	 • Slide the sliding window on to the aerofoil. Cabinet in work mode – not safe Window is not in the working position MENU | Socket=Off
2	The display will ask for the user code (only when the user code is activated).	• Push button to turn off the cabinet.
3	The fan will be switched off.	• Enter the user code and push button A. Cabinet switched off – Not Safe Monday 11:06:33 MENU | Socket=Off

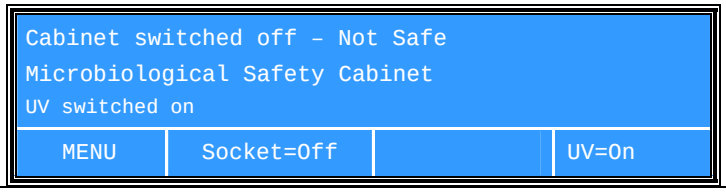
5.8 Control UV (optional)

The UV-function is only visible if this option is installed, and with a closed window. In all other cases, the UV will be switched off and the function at the display is invisible.

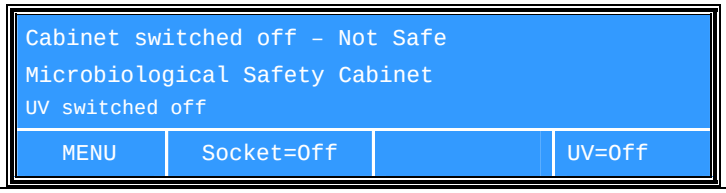
UV can only be switched on with a closed window!
This prevents direct contact on the skin or eyes of the personnel.

Switching UV on

1	The window must be closed on the aerofoil or in disinfection mode. Cabinet must be switched off or in power safe mode. The display shows "UV=Off".	

2	The UV will switch on. The display shows "UV=On".	• Push button 4 (UV=Off). 

Switching UV off

3	The UV will switch off. The display shows "UV=Off".	• Push button 4 (UV=On). 

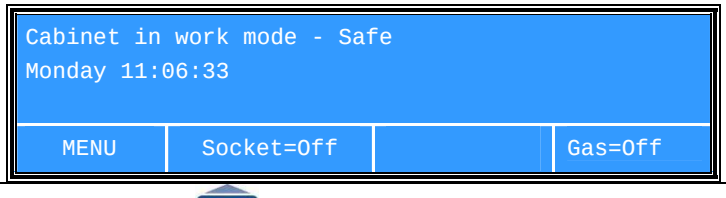
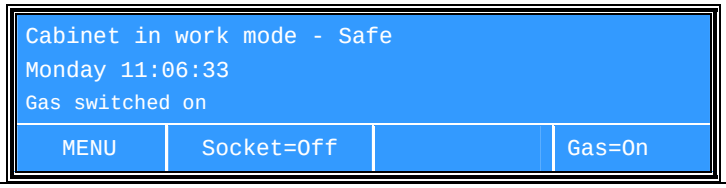
If the window is opened during a working UV light the UV will stop.
FL (Fluoresced lamp)-Lighting and UV cannot be switched on both at the same time. As a safety precaution, one of them will automatically switch off.

5.9 Control gas supply (optional)

The gas-function is only visible if this option is installed and the cabinet is in work mode with no air alarms. In all other cases, the gas valve will automatically be switched off and the gas-function is invisible.

The gas valve, which controls the gas supply, can only be switched on in the work mode and when there are no airflow alarms (this is not possible in the start-mode).

Switching gas supply on

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	The display shows "Gas=On". The gas valve will be switched on.	• Push button 4 (Gas=Off). 
3	Turn the gas tap: open/close.	

Switching gas supply off

4	The display shows "Gas=Off". The gas valve will be switched on.	• Push button 4 (Gas=On).

		Cabinet switched off – Not Safe Microbiological Safety Cabinet Gas switched off MENU | Socket=Off | | Gas=Off

5.10 Control sockets

The sockets can always be switched on and off. If the cabinet is switched off, the sockets are automatically switched off. Also if the cabinet is switched from work mode into power save mode, the sockets are automatically switched off.
See technical specification (see *§9.2 General specifications on page 61*) for maximum voltage and current (fuses).

Switching socket on

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	Cabinet in work mode - Safe Monday 11:06:33 MENU | Socket=Off | |
2	The display shows: Socket=On. Power of socket is switched on.	• Push button 2 (Socket=Off). Cabinet in work mode - Safe Monday 11:06:33 Socket switched on MENU | Socket=On | |

Switching socket off

3	The display shows: Socket=Off. Power of socket is switched off.	• Push button 2 (Socket=On). Cabinet in work mode - Safe Monday 11:06:33 Socket switched off MENU | Socket=Off | |

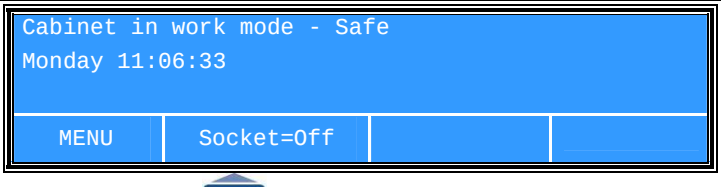
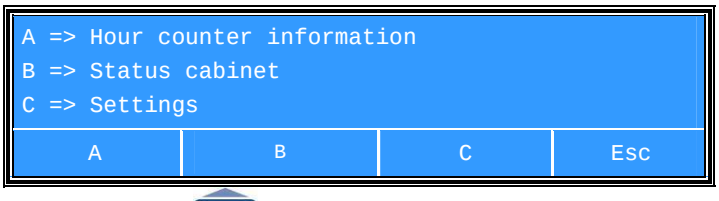
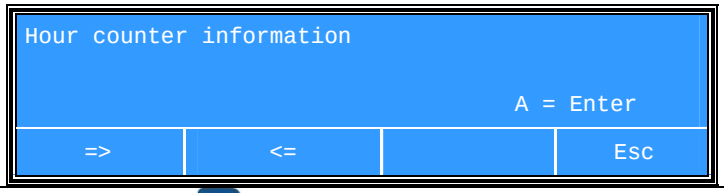
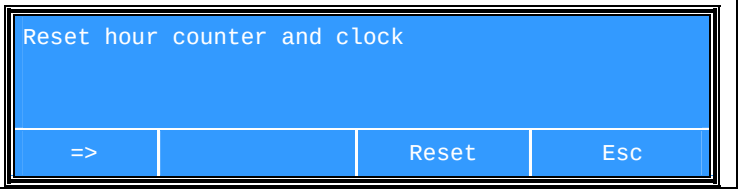
5.11 Menu functions

From the main menu you can go to: § 5.12 General information, § 5.13 Information about the status of the cabinet and § 5.14 information about the settings.

5.12 General Information

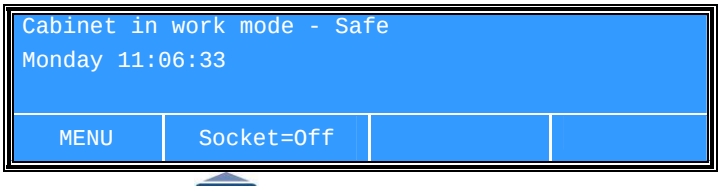
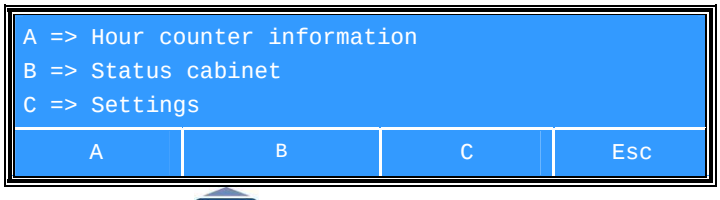
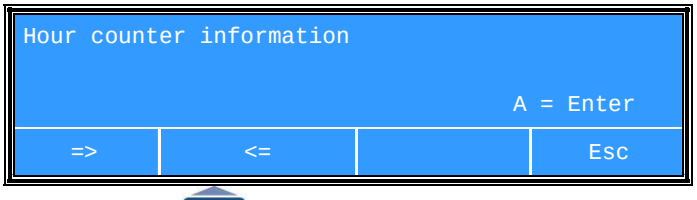
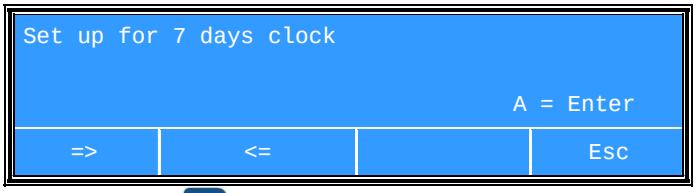
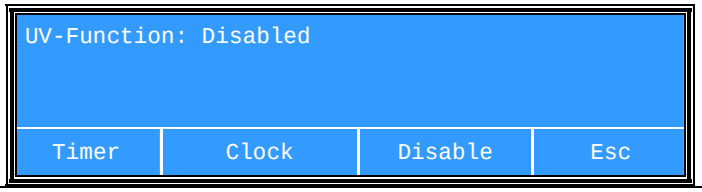
In general information more details are given about:
- Hour counter information and reset (FL, UV, Timer)
- Set up 7 days clock UV (Example)
- Set up socket 7 days clock
- Set up cabinet 7 days clock
- Set Actual time

Hour counter information and reset (FL, UV, Timer)

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu).
2		 • Push button 1 (A).
3	Hour counter display shows.	
4	Hour counter information shows.	• Push button A. *FL= Fluoresced lamp
There are three different possibilities, see 5a, 5b and 5c.		
5a	Reset <u>all</u> timer and clock adjustments?	• Push button 1 (=>). 

		• Push button 3 (Reset). • Push 2x button 4 (Esc) for starting menu.
5b	Reset FL counter?	• Push button 2 (reset A). • Push button 1 (Reset). • Push 2x button 4 (Esc) for starting menu.
5c	Reset UV counter?	• Push button 3 (reset B). • Push button 1 (Reset). • Push 2x button 4 (Esc) for starting menu.

Set up 7 days clock UV

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu).
		 • Push button 1 (A).
		 • Push button 1 (=>).
	Set up for 7 days clock UV shows.	 • Push button A.
		
	There are three ways to set the UV: - 2a. Timer - 2b. 7 days clock	

- 2c. Disable

Timer

2a	The timer sets a period until the UV turns off.	• Push button 1 (Timer), to set up the timer. • Push button 3 (Change), to change the time. • The value can be changed by pushing button 1 (>>), 2 (+) or 3 (-). • Acknowledge the setting with button A. • Push 2x button 4 (Esc) for starting menu.

Clock (7 days clock)

2b	With the clock function, for each day of the week, you can set a variable period for the UV to be switched on. Keep in mind, you have to set the starting hour and starting minute for each day separately! For detailed information regarding programming this menu, see *§5.11 Set up 7 days clock UV on page 33* .	• Push button 2 (Clock), to set up the 7 days clock. • Push button 3 (Change), to change starting time en ending time. • The value can be changed by pushing button 1 (>>), 2 (+) or 3 (-). • Acknowledge the setting with button A. • Push 2x button 4 (Esc) for starting menu. See also the *Example on page 34*.

Disable

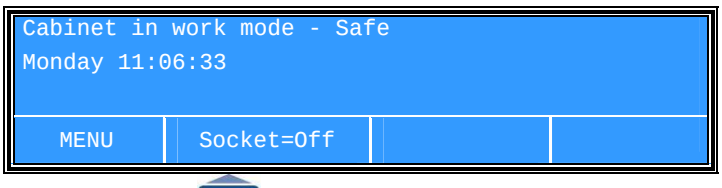
2c	By pushing on "Disable" the UV can only be turned on and off manually.	• Push button 3 (Disable), to set the UV manually. • Push 2x button 4 (Esc) for starting menu.

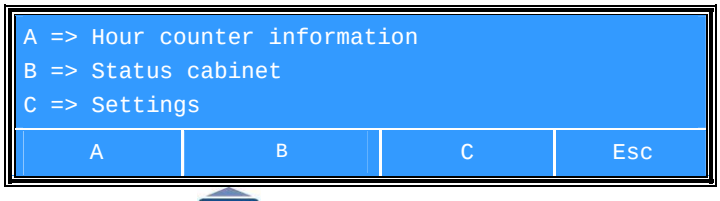
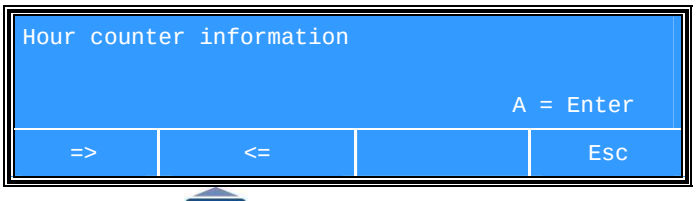
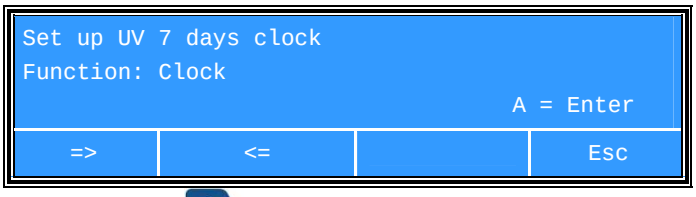
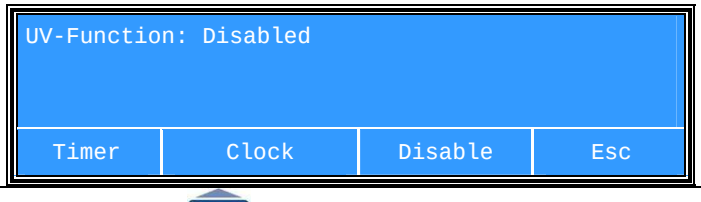
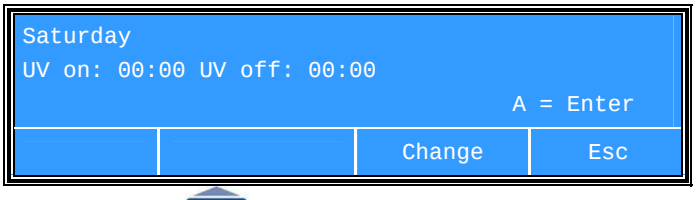
Please select not only a starting time, but also an ending time for every programmed day. Otherwise the UV will stay on until 00:00 h and only then turn off. See also the *Example on page 34.*

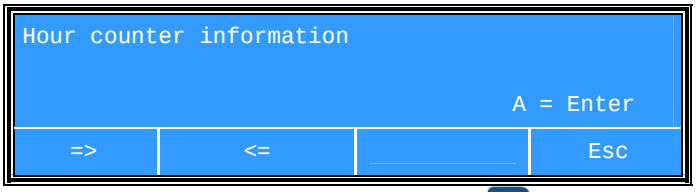
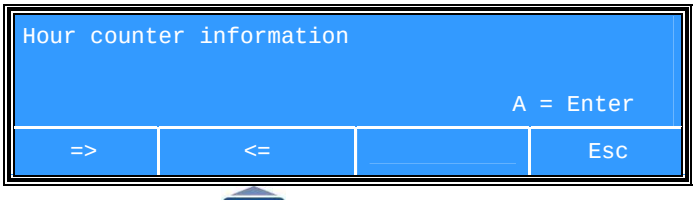
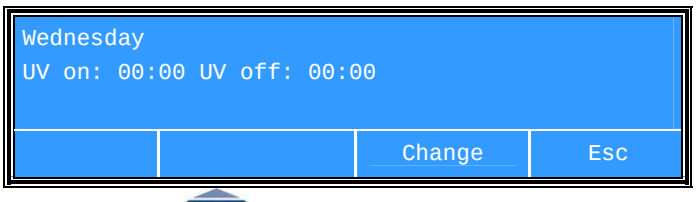
Example

Programming the 7 days clock UV will be given as an example.
Switch on the UV Tuesday evening 22.00 and switch off the UV Wednesday morning 06.00.

(See *§5.11 Hour counter information and reset (FL, UV,* Timer) *point 5a on page 32,* for deleting all Hour counter programmed information).

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu).

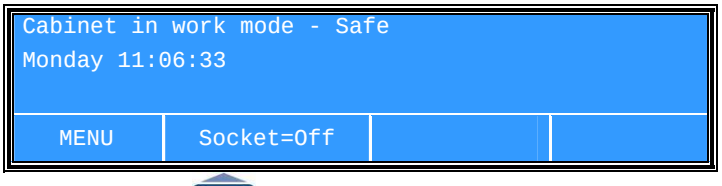
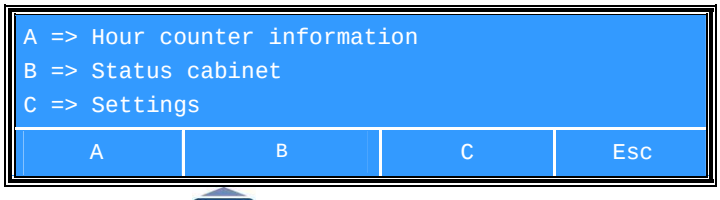
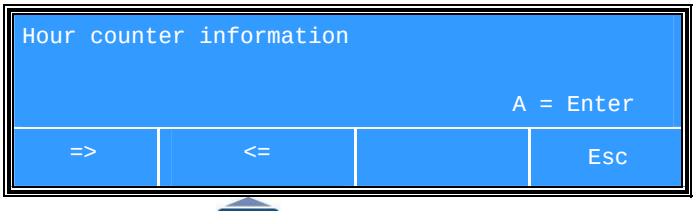
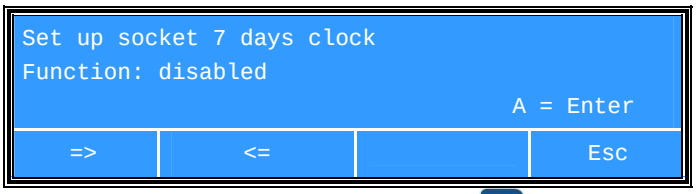
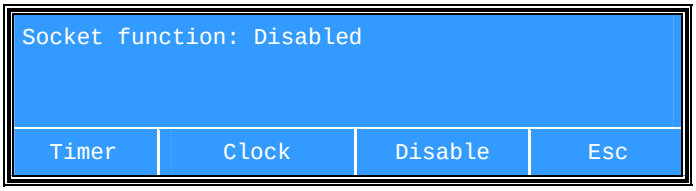
	Set up for 7 days clock UV shows.	 • Push button 1 (A).  • Push button 1 (=>).  • Push button A. 
2	Set up the UV 7 days clock	• Push button 2 (Clock) for setting up the UV 7 days clock.  • Push button 3 (Change) for changing the start and end time. • The value can be changed by pushing button 1 (>>) , 2 (+) or 3 (-).
3	Set up UV **starting time Tuesday evening 22.00**. -Change start day, -Change start hour (22.00), -Change start min (22.00), -Change stop hour (00.00),	• Saturday has to be changed into Tuesday, UV starting time at 22.00 and UV off at midnight 00.00. The display shows:

	-Change stop min (00.00).	 • Acknowledge the setting with button A.
4	Set up UV switching off on **Wednesday morning 06.00**. -Change stop day, -Change start hour (00.00), -Change start min (00.00), -Change stop hour (06.00), -Change stop min (06.00).	 • Push button 1 (=>), then button A, then button 2 (Clock) and then button 3 (Change). • Tuesday has to be changed into Wednesday, UV starting time at midnight 00.00 and UV off at 06.00. • The display shows: • Acknowledge the setting with button A.  • Push 2x button 4 (Esc) for starting menu.
5	Check of programmed UV Clock	• Push 3x button 1 (Menu). • Push button A. • Push button 2 (Clock), for checking the UV clock (day by day).  • Push button 3 (Change), to see what has been programmed.

		•

		• The value can be checked by pushing button 1 (>>) change day. Every days program can be controlled by pushing 2 (+) or 3 (-). • Important! **Don't touch** A, only use 2x button 4 (Esc) to go back to the main menu.

Set up socket 7 days clock

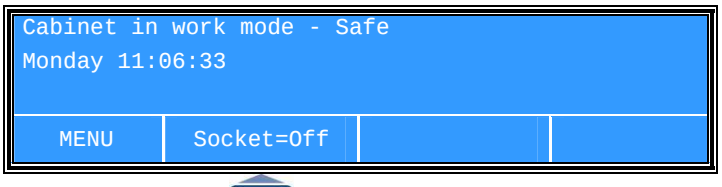
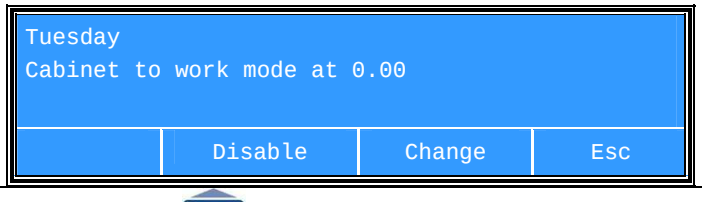
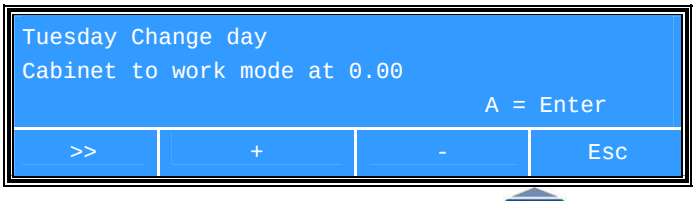
1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.* Set up display for socket 7 days clock shows.	 • Push button 1 (Menu).  • Push button 1 (A).  • Push 2x button 1 (=>).  • Acknowledge the setting with button A. 

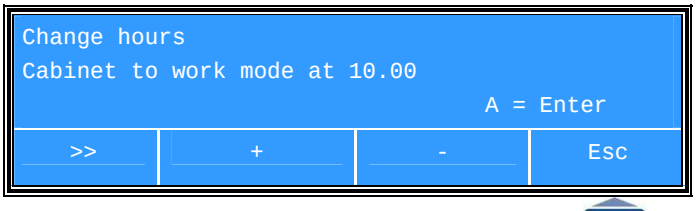
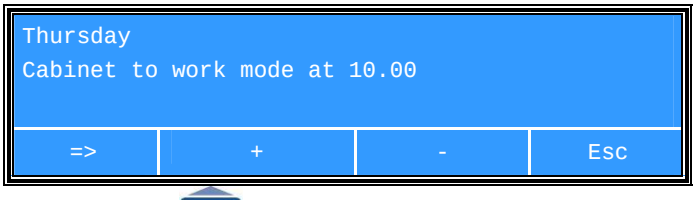
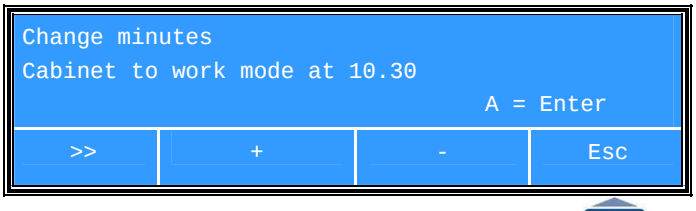
There are three ways to set the sockets:
- Timer
- 7 days clock
- Disable

2	See *§5.11 Set up 7 days clock UV on page 33 and further.* See also the *Example for programming the UV-lamp on page 34.*	The timer function needs to be activated first, otherwise the sockets will not switch on.

Set up cabinet 7 days clock

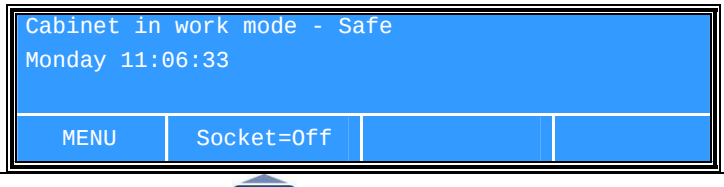
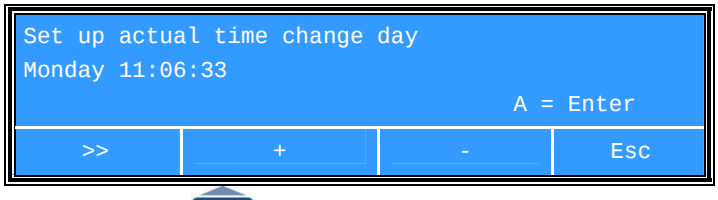
With this menu it is possible to program an automatic switch action on of the cabinet. It is however not possible to switch off the cabinet itself automatically!

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push 5x button 1 (1x Menu, 1 x A and 3x =>), • Acknowledge the setting with button A. 
2	Disable	• Push button 2 (Disable), to reset all previous settings.
3	Change days:	• Push button 3 (Change), to change the day.  • The value can be changed by pushing, 2 (+) or 3 (-).
4	Change hours:	• Push button 1 (>>) to change the time.

		 • The value can be changed by pushing button 2 (+) or 3 (-).
5	Change minutes:	 • Push button 1 (=>) again, to change the minutes.  • The value can be changed by pushing button 2 (+) or 3 (-).
6	Acknowledge the setting.	Acknowledge the setting with button A. Push 2x button 4 (Esc) for starting menu.

For more days / hours / minutes, walk again through the menu and confirm each time.

Set up actual time

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	Set up actual time: Set up display the actual day shows.	• Push 6x button 1 (1x Menu, 1 x A and 4x =>). • Acknowledge the setting with button A.  • Push button 1 (=>).

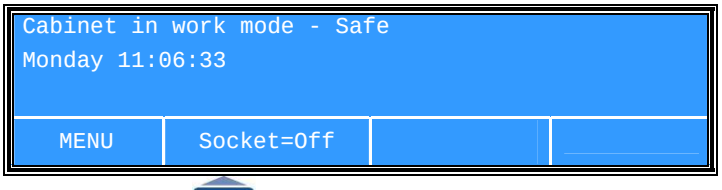
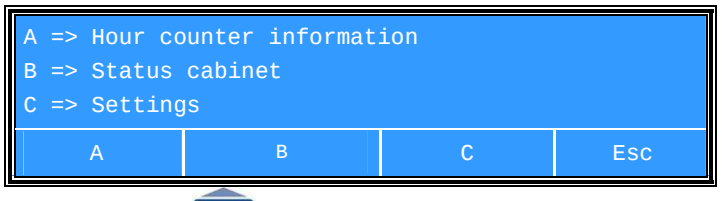
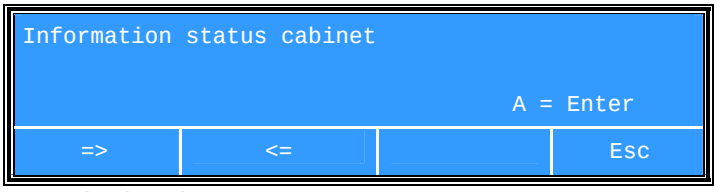
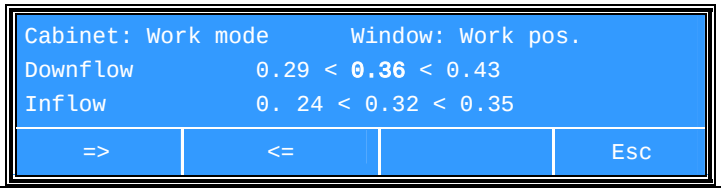
		• The day can be changed by pushing button 2 (+) or 3 (-).
3	Change hours/min/sec: Set up display set up the actual time shows.	• Push button 1 (>>) again. • The hours/min/sec can be changed by pushing button 2 (+) or 3 (-).
4	Acknowledge the settings	• Acknowledge the setting with button A. • Push 2x button 4 (Esc) for starting menu.

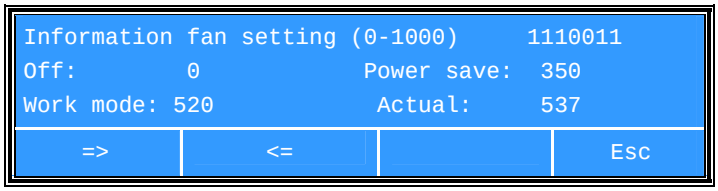
Actual time appears when there are no more alarms.
In case of power failure, actual time is kept in memory for one month.

5.13 Information status cabinet

In this menu the settings of the cabinet can be checked to inform service personnel.
In information status more details are given about:

- Actual velocities, alarm setting and fan settings
- Information about the installed options (Sockets, UV)
- Information about Options relays
- Information about Analog inputs (only visible when option is activated)

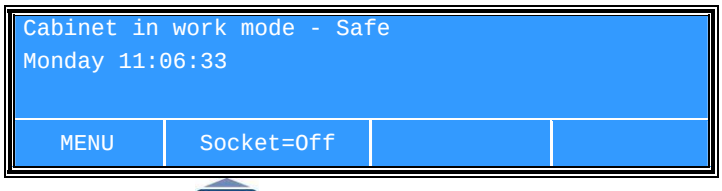
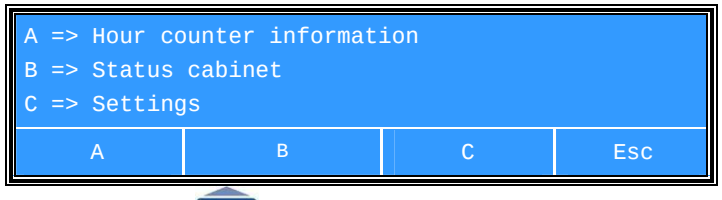
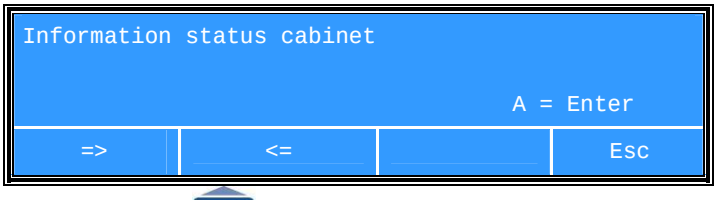
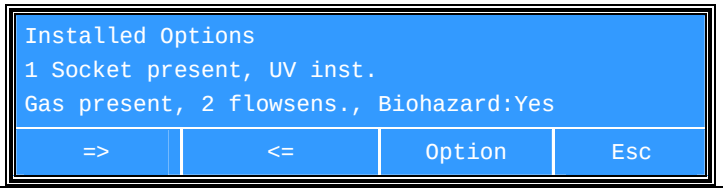
1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu).  • Push button 2 (B).
2	Status Display:	 Status display shows
3	Status Information *[1]: Example with colours)	• Push button A. 

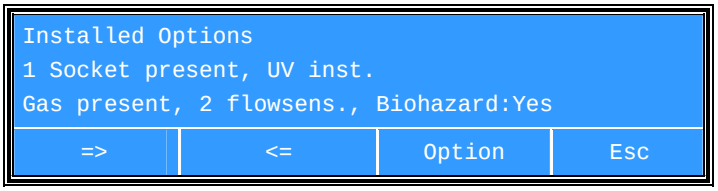
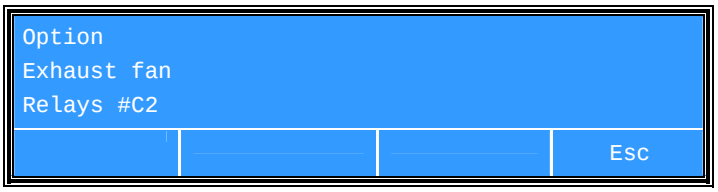
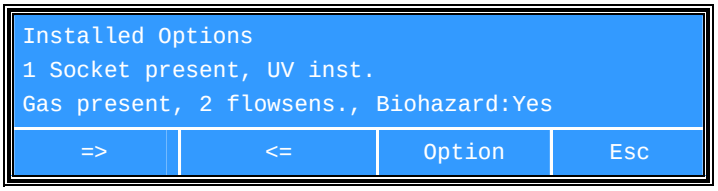
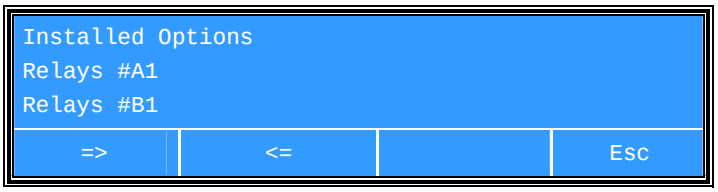
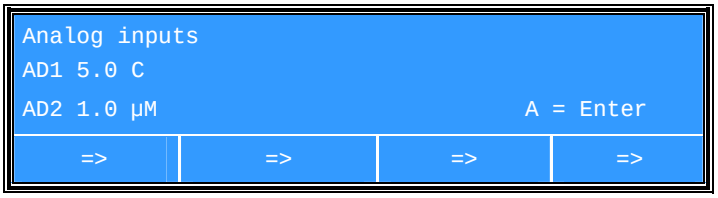
		Status information cabinet shows (see example). • Middle numbers are the actual air speeds (yellow); • Left and right numbers are the set up alarm borders (red).
4	Information fan shows	• Push button 1 (=>).  The seven-digit number in the upper right corner is only meant for service aims. • Push button 4 (Esc) for starting menu.

*[1] The average inflow velocity at the top of the front aperture is measured and can be read in the display. The minimal required value of the average inflow velocity measured at the top of the front aperture is given in chapter 9.2 on page 61. Measuring these most critical measured values directly under the window ensures that the overall average inflow velocity is according to the guidelines of the EN12469:2000 (Annex H table H1 Mean inflow velocity to achieve operator protection > 0,4 m/s).

Information about the installed options

(The display only shows when the options are installed)

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu).  • Push button 2 (B).
2	Information about the installed options is given (example):	 • Push button 1 (=>). 
	From here there are 3 possibilities (examples): - 3a. Screen I - 3b. Screen II - 3c. Screen III	

3a	Options **Screen I** Starting up from Step 2	 Installed options display shows. • Push button 3 (Option).  For explanation codes see *Appendix IX: Information installed* options *on page 84*. • Push 2x button 4 (Esc) for starting menu.
3b	Options **Screen II** Starting up from Step 2	 Installed options display shows. • Push button 1 (=>).  For explanation codes see *Appendix IX: Information installed options on page 84*. • Push button 4 (Esc) for starting menu.
3c	Options **Screen III** (Display only appears when analogue options are installed) Starting up from Step 2	• Push 2x button 1 (=>).  For explanation codes see *Appendix IX: Information installed options on page 84.* • Push button 4 (Esc) for starting menu.

5.14 Settings

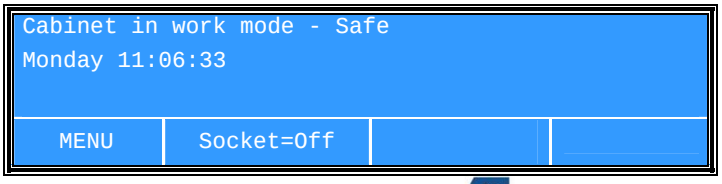
In settings more details are given about:

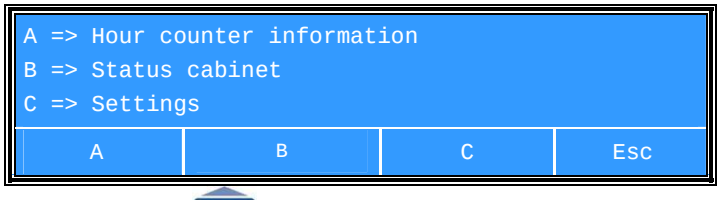
- Preparations for disinfection
- Activating the user code
- Factory adjustments
- Testing of alarms
- Change the user code
- Change language

Disinfection

Your Biological Safety Cabinet has a "built-in" disinfection software program.
This program knows a number of varieties, which are dependent on the installed options in the security cabinet, and the manner the cabinet has been installed.
The disinfection software of the control print is only available in version number 2.4 270307 or higher. **The disinfection software itself is no disinfection!**
The Biological Safety Cabinet EF/S can work according to automatic disinfection software only if this has been installed.
Consult your order affirmative for the installed options or contact Clean Air B.V.
In case additional information about Disinfection is needed, please contact Clean Air B.V.
Also check the site of Clean Air B.V. (www.cleanair.eu/products/downloads) for more detailed information about disinfection.

Depending on the code of the installation the safety cabinet will react differently. These codes are programmed for an optimised disinfection process. The code itself is already pre-installed on the cabinet depending on the installed options mentioned in your order affirmative or contact Clean Air Techniek.

<table>
<tr><td></td><td colspan="2">• Check if the cabinet is gastight.
• Use the valid standard operation procedure (SOP) since the disinfection procedure depends on the handlings performed in the cabinet.</td></tr>
<tr><td>1</td><td>Cabinet in work mode.
See §5.4 Starting up the cabinet on page 26.</td><td> 

• Switch off the cabinet with button .
• Push button (Menu).
 

• Push button (C).
• Push button .</td></tr>
<tr><td>2</td><td>Preparations for disinfection:</td><td>

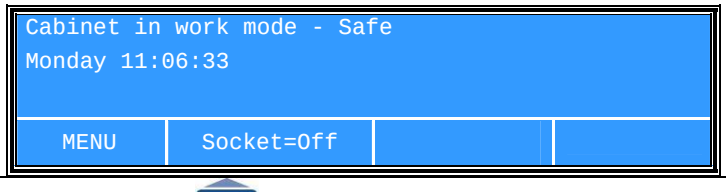
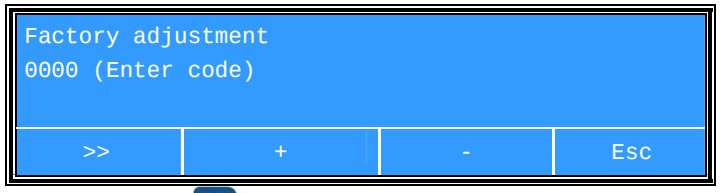
Preparation for disinfection display shows.
• After entering the user code (pre settings 0001) push</td></tr>
</table>

		button A. • Push button 2 (check OK) The aerofoil has to be removed out of the work area and the window has to be closed completely. The valve on the exhaust (if present) has to closed. • Push button 1 (Start). • Re-enter the user code. • Push button A. The preparation for the disinfection starts.
3	Abort the disinfection:	• Push button 4 (Stop) to stop the disinfection.
	For more information about disinfection see *Appendix II: Disinfection on page 67* and website www.cleanair.eu, *Products/Downloads*.	**The disinfection software itself is no disinfection!**

Activating the user code

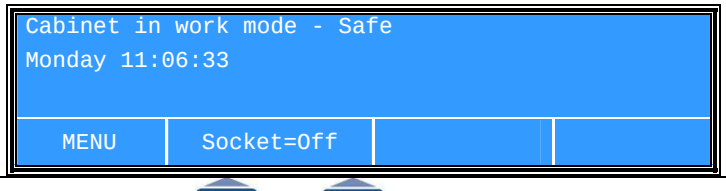
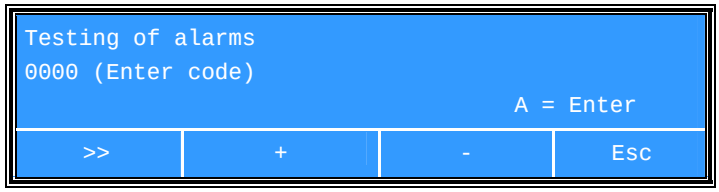
See *Appendix X: User code on page 87*.

Factory adjustments

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	Factory adjustments: Factory adjustment display shows. Factory settings can be changed here (authorized personnel only). See service manual for more information. (Version: X.X =version of Display board, I/0: VX.XX= version of IO board, OPT: VX.X = version option board)	• Push button 1 (Menu). • Push button 3 (C). • Push 2x button 1 (=>). • Push button A. • Enter the code for "Factory adjustment" (authorized personnel only).  • Push button A. • Push button 4 (Esc) for starting menu.

Testing of alarms

For service purposes only! More information in *Appendix VII: Alarm-test procedure on page 79.*

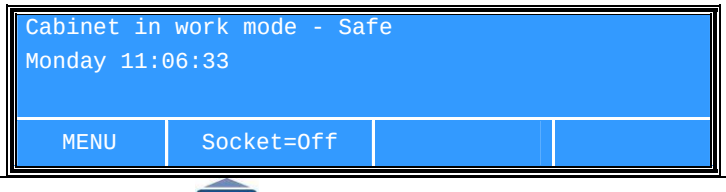
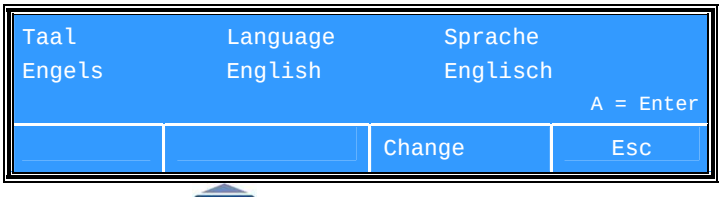
1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	Testing of alarms display shows:	• Push button 1 and 3 (C). • Push 3x button 1. • Push button A.  • Enter service code.
3	For service purposes only!	The various values of the fan and velocities are shown on the display. In case of interference, inform you service organization.

Change the user code

See *Appendix X: User code on page 87.*

Change language

To change the language, first close the window, switch off the cabinet and all functions. Then the language can be changed and confirmed. As confirmation the 3 LED's (right) light up for 1 second and 2 short beeps will sound. The cabinet will be switched on automatically.

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	Change the language	• Push button 1 (Menu). • Push button 3 (C). • Push 5x button 1 (=>). • Push button A. Conditions: The fan has to be switched off (push *), the window has to be closed completely and sockets and FL-light must be switched off.  • Push button 3 (Change) to change the language. • Push button A.

6 Alarms

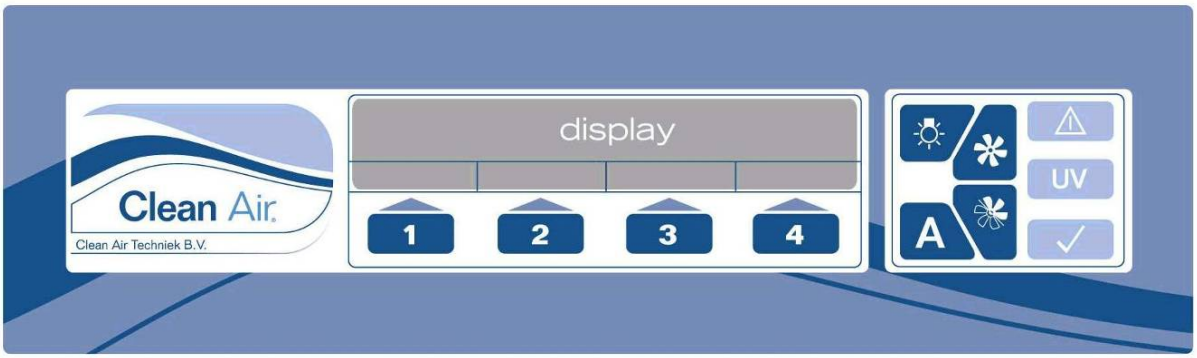


Figure 18 Operating panel

When there is an alarm situation the alarm indicator flashes red ⚠ and there is an acoustic signal. The safe working conditions are no longer granted.

Push button A for giving an acknowledgement that the user has seen the alarm. The alarm indicator will (always) keep on burning. Before acknowledging the alarm, the user code must be entered (only when the user code is activated).
An acknowledged alarm (with button A) shall be repeated every 7 minutes, as long as the alarm situation continues.
The buzzer has a SPL, sound pressure level, of at least 10 dB (A)* more than the sound pressure of the working cabinet. See *Appendix XI: Required specifications on page 89.*
(*In one band of the Terz band analysis mentioned in the technical reports from the TÜV-Nord)

	GENERAL DANGER Make sure that there are no alarm situations during the use of the cabinet. Never work with a cabinet with activated alarm signals.

The different types of alarm signals will be discussed in the following chapter.

6.1 Most frequent window alarms

Window is not in work position

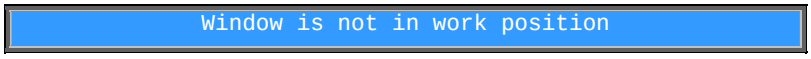


Figure 19

Window above window position:
Person protection is less, aerosols from the work area can go outside the cabinet, because of a weakened air curtain.
Product protection is less, aerosols from the outside can go into the cabinet, because of a weakened air curtain.

Window below window position:

Person protection stays intact.
Product protection cannot be granted.
The inflow air through the work opening has a higher speed and may pass the front air slits of the working surface.

Window on lowest window position:

When the window is slid down in its lowest position and the aerofoil is removed, this message will be on the display.

6.2 Flow alarms

If one of the following alarms occurs and no apparent cause can be found, the service department has to be contacted. They will ask for the status of the cabinet, which helps to find possible causes (see *§5.13 Information status cabinet on page 40*).

Downflow too low

Figure 20

Product protecting downflow is too low.
Product protection becomes less, there is a chance that aerosols from the outside go into the working area. Person protection stays intact.

Downflow too high

Figure 21

Product protecting downflow is too high.
Product protection stays intact.
Person protection becomes less, because the collision of particles against the personnel's arms increases. Aerosols can escape through the air-curtain to the outside.

Inflow too low

Figure 22

Product protection stays intact.
Person protection becomes less; aerosols from the work area can go outside the cabinet, because of a weakened air curtain.

Inflow too high

Figure 23

Person protection stays intact.
Product protection becomes less.
The inflow air through the work opening has a higher speed and may pass the front air slits of the working surface.

6.3 Other alarms

Other alarms are:

Fan failure

Figure 24

Most likely the fuse is broken. Replace it with a new one. If the alarm is still there, contact your service organization.
To reset this alarm you must disconnect the power plug from the main voltage.

Communication error

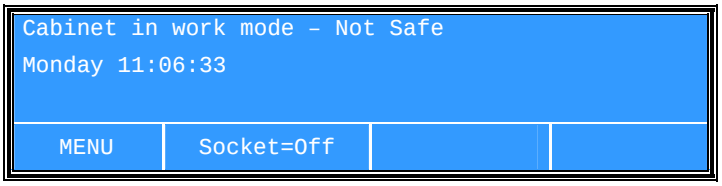
Figure 25

Contact your service organization.

	Overview possible alarms:						
	No alarm	Window above working position	Window below working position	Downflow too low	Downflow too high	Inflow too low	Inflow too high
Person protection:	Yes	No	Yes	Yes	No	No	Yes
Product protection:	Yes	No	No	No	Yes	Yes	No

Table 1: Alarm situations in work position

Procedure in case of alarms

	Check if the window is in the working position.	 When the window is back into the working position the alarm will not mute immediately. The cabinet needs time to get the correct airflows.
	In case the alarm is still present: Stop working, close the window, and push button .	The cabinet goes into the saving position.
	Read the alarms from the display. Contact your service organization.	 Working with the cabinet is not possible anymore.

7 Cleaning

	CYTOTOXIC DANGER When cytotoxics are used, see *§2.5 Cytotoxic danger (EF/B only) on page 10.* Only the responsible safety officer (biological safety officer or the responsible examiner) can decide if this procedure is valid or not. Additional standard operation procedures can be necessary.

7.1 Cleaning the installation

The installation has to be cleaned regularly. Preferably, each time after the installation has been used. Diluted disinfectants may be used. In most cases, hot water with a cleaning agent will be sufficient.
Chlorine containing cleaning agent is not recommended, because even small concentrations chlorine may result in an oxidizing effect on the material of the installation.
It is important to clean the worktop (see *§4.6 Worktop on page 15*), the space under the worktop and drip-trays regularly. A 1% solution of Natriumdodecylsulfat * (SDS-solution CAS-no. 151-21-3) in demineralised water could be applied for cleaning.
Remove the waste and place it in an appropriate container.
*) Literature:
See Mallinckrodt J.T. Baker data sheet: SDS is MSDS number No S3670
Mallinckrodt Baker Inc. 222 Red School Lane Phillipsburg, NJ 08865

Procedure for cleaning the cabinet

	BIOLOGICAL DANGER Never clean a used installation without precaution (for instance disinfection)

- Switch the installation in the working mode (see *§5.4 Starting up the cabinet on page 26)*;
- Put on gloves;
- Clean the surface with the SDS-solution on a tissue (Natriumdodecylsulfat solution);
- Repeat this action with a new tissue;
- Clean the surface with a moist cloth;
- Repeat this action;
- Dry the surface with a paper tissue.

Cleaning the aerofoil

	BIOLOGICAL DANGER Never take the aerofoil outside a used cabinet without precaution (for instance disinfection)

- Put on gloves;
- Clean the top side of the aerofoil (see *§7.1 Cleaning the installation on page 51);*

- Take the aerofoil out the front slit and take the aerofoil outside the cabinet. Take care whether you can take out the aerofoil, does the cabinet have to be disinfected first? (See *Appendix II: Disinfection on page 67*);
- Clean the sides and below side of the aerofoil (see *§7.1 Cleaning the installation on page 51);*
- Clean all visible parts which are normally covered by the aerofoil (see *§7.1 Cleaning the installation on page 51);*
- Place the aerofoil back.

Cleaning the worktop

	BIOLOGICAL DANGER Never take the worktop out of an used installation without precaution (for instance disinfection)

- Clean the top side of the worktop (see *§7.1 Cleaning the installation on page 51);*
- Stick the auxiliary key in the slots at the front side of the worktop;

Figure 26 Auxiliary key

- Fold the worktop up against the back partition of the working space;

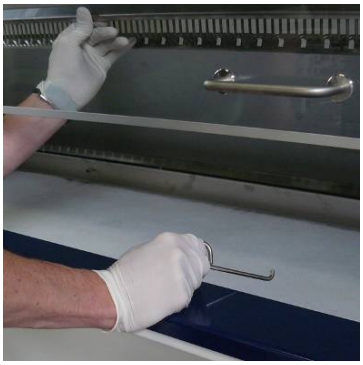


Figure 27 Fold the worktop against the back partition

- Clean the sides and bottom part of the worktop;
- Fold the worktop back in place.

Cleaning the inside of the window

Check if this procedure can be done safely. It is advised to disinfect the installation first (see *Appendix II: Disinfection on page 67*).

Procedure for cleaning and to disinfect the window with liquid:
- Put on gloves;
- Switch off the installation (see *§5.7 Turn off on page 28*);
- Hinge the window open (see *§5.2 Hinge the window on page 22*);
- Clean (and, if necessary, disinfect) the window;
- Clean (and, if necessary, disinfect) the rubber seal;
- Smear the seal thin with Vaseline;
- Hinge the window close.

Please note: the cleanability of the biological safety cabinet is at least conform Class CI-B (EN 12469:2000-table 2: Cleanability performance).

7.2 Cleaning the UV-light (optional)

	BIOLOGICAL DANGER Never clean an used installation without precaution (for instance disinfection)
	DANGER FOR ELECTROCUTION

The UV-light must be cleaned regularly with alcohol (70%). Put on gloves and switch of the cabinet and let the UV-light cool down before cleaning. After cleaning the UV-light tube must be dried before using it.

7.3 Guideline for cleaning of cytotoxic contaminated surfaces (EF/B only)

	CYTOTOXIC DANGER When cytotoxics are used, see *§2.5 Cytotoxic danger (EF/B only) on page 10.* Only the responsible safety officer (biological safety officer or the responsible examiner) can decide if this procedure is valid or not. Additional standard operation procedures can be necessary.

In the "contract of employment agreement" of Dutch hospitals of June 2004 a guideline is given for cleaning of cytotoxic contaminated surfaces.

Summary of this guideline:

Cabinets contaminated with cytotoxics are normally cleaned with a 1% solution of Natriumdodecylsulfat (SDS-solution CAS-no. 151-21-3) in demineralised water, as described in *§7.1 Cleaning the installation on page 51*.
In addition to this cleaning procedure it is recommended to clean the cabinets surfaces with a 70% Ethyl alcohol solution (ethanol) CAS-no. 64-17-5.
This can be necessary to ensure sterile conditions for example against bioagentia.
To complete this process gas disinfection can be necessary.

Exceptions

A few cytotoxics have a different cleaning procedure.

Example 1:

Cytotoxic	**CAS-no.**	**Recommended cleaner**
Azathioprine	446-86-6	250 ppm Hypochloriet (Sodium Hypochlorite) CAS-no. 7681-52-9.
Bleomycine	11056-06-7	
Daunorubicine(Daunomycin)	20830-81-3	
Doxorubicine	23214-92-8	
Epirubicine	56420-45-2	
Fluorouracil	51-21-8	
Idarubicine	58957-92-9	
Mixantron (Mitoxantrone)	65271-80-9	
Vinblastine	865-21-4	
Vincristine	57-22-7	
Vinorelbine (Navelbine)	71486-22-1	

Example 2:

Cytotoxic	**CAS-no.**	**Recommended cleaner**

Chloormethine (Mechlorethamine)	51-75-2	0,1 N Natronloog (Sodium Hydroxide) CAS-no. 1310-73-2.
Dactinomycine	50-76-0	
Estramustine	2998-57-4	

Example 3:

Cytotoxic	**CAS-no.**	**Recommended cleaner**
Mitomycine	C= 50-07-7	0,1 N HCL (Hydrochloric Acid) CAS-no. 7647-01-0.

8 Small maintenance and testing

	BIOLOGICAL DANGER **BE CAREFUL!!** Before starting service with the cabinet a written declaration "that the cabinet is decontaminated" must be present. The responsible person (laboratory supervisor) will decide if the cabinet has to be decontaminated so that when servicing the installation and the HEPA-filters there is no danger for the service engineer, labour personnel, the laboratory and the surroundings of the cabinet. If necessary disinfect the installation. For more information *Appendix II: Disinfection on page 67*.
	CYTOTOXIC DANGER When cytotoxics are used, see *§2.5 Cytotoxic danger (EF/B only) on page 10.* Only the responsible safety officer (biological safety officer or the responsible examiner) can decide if this procedure is valid or not. Additional standard operation procedures can be necessary.

8.1 Periodic maintenance

A periodic maintenance has to take place regularly. To a certain extent, this depends on the frequency of use of the cabinet. Contact your service organization for advice.
Guideline for testing and maintenance given by Clean Air Techniek B.V. is every 12 months at least.

- Validate the system on safety;
- Check for correct functioning of the electrical system;
- Check the HEPA filter for efficiency and leakage;
- Check the installation and the exhaust system for leakage;
- Verification/calibration of the assembled air speed sensor(s);
- Check and adjust the alarm system.
- Check if the air direction of the inflow is in direction of the front aperture and laminar over the whole area of the front aperture;
- Check if the air direction of the downflow is downwards in direction of the work surface and laminar over the whole work surface.

8.2 Replacement of the pre-filter

(See *§4.9 Drip tray/pre-filter on page 16*).
Tip:
This procedure must be done with a running fan. Then the under pressure in the working area will stay. This is an extra safety aspect. Since this procedure can be done in a short time, the extra pollution of the HEPA filters will be low.
This procedure is described for a right-hand orientated person. The described left hand may be changed for a right hand and right for left hand as long as this is done consistently (this procedure needs consistence due to contamination danger).

Supplies needed:

- Usermanual;
- Plastic bag (minimum measurement 75x50 [cm] with closure);
- Two pairs of gloves;
- Tape;
- Working surface hook (auxiliary hook);
- Possible disposing requirements;
- New pre-filter (measurements of the pre-filter are necessary when ordering a new one, the measurements are printed on the type plate (see *§4.1 Type plate on page 14* and *Appendix VIII: Stickers on page 81*).

Figure 28 Supplies needed

Procedure:

- Switch on the installation;
- Make sure that the window is in the working position and that there are no alarms;
- Put on the gloves and keep an extra pair ready for use on the aerofoil;
- Fold the edge of the plastic bag ±10 cm;

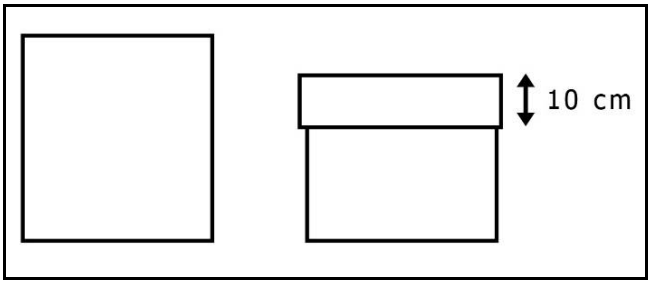


Figure 29 Folding the edge of the bag ±10 cm

- Lift up the worktop with your left hand using the working surface hook and put it against the back partition with your right hand;

Figure 30 Lifting up the worktop against the back partition

- Place the opening of the plastic bag inside the front aperture with your left hand;

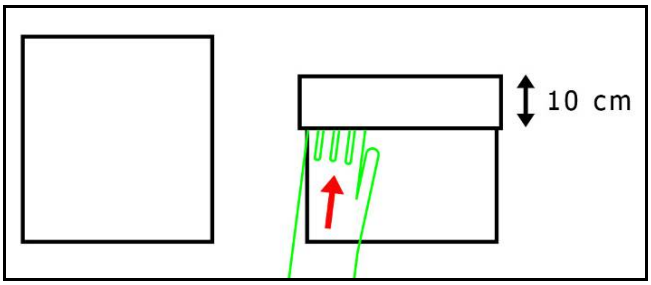


Figure 31 Positioning the left hand in the plastic bag

Figure 32 Positioning the plastic bag on the aerofoil

- Positioning the plastic bag on the aerofoil;
- Pull the pre-filter from its frame with your right hand;
- Roll the filter up (still with your right hand);
- Put the filter into the plastic bag;

Figure 33 Put the filter into the bag

- Fold back the edge of the plastic bag, not touching the inner side of the plastic bag;
- Press the air out of the bag (with its opening still in the working space);
- Seal the plastic bag airtight;
- Remove the plastic bag and place it in an appropriate container;
- Put on new gloves;
- Place a new pre-filter in the frame;
- Fold the worktop back in its position;
- Remove the gloves and put them in the appropriate container.

8.3 Replacing the Fluorescent-light (FL light)

When an FL light (see *§4.20 FL-lighting on page 18*) needs to be changed, the top hood can be lifted. Switch off the power of the installation. Replace the FL tube by a new one (see *Figure 34)* and close the top hood.

	DANGER FOR ELECTROCUTION

Figure 34 Position of the FL-tubes

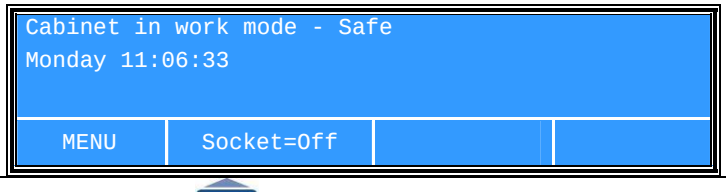
8.4 Service contact

For advice or any technical questions please contact your service organisation. Please refer to the following items:

- Type, Class, Project number and Serial number mentioned on the type plate

(for the position of the type plate see *page 14* and *page 81*);
- Version number of the software used in the safety cabinet.

Software Version

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	Software version:	• Push button 1 (Menu). • Push button 3 (C). • Push 2x button 1 (=>).

8.5 Service Contract

For information and orders concerning service or service contracts please contact Clean Air Techniek B.V.

8.6 Testing

Recommended tests for first installation or after changing the HEPA filters are:
- Velocity tests (see *Appendix V: Measuring method air velocities on page 76);*
- Filter Integrity tests (see *Appendix IV: Efficiency test of the HEPA filters on page 74);*
- Alarm tests (see *Appendix VII: Alarm-test procedure on page 79).*
- Check visual if the air direction of the inflow is in direction of the front aperture and laminar over the whole area of the front aperture by the use of smoke;
- Check visual if the air direction of the downflow is downwards in direction of the work surface and laminar over the whole work surface by the use of smoke.

Recommended tests after installing with a regular interval are:
- Velocity tests (see *Appendix V: Measuring method air velocities on page 76);*
- Filter Integrity tests (see *Appendix IV: Efficiency test of the HEPA filters on page 74);*
- Alarm tests (see *Appendix VII: Alarm-test procedure on page 79).*
- Check visual if the air direction of the inflow is in direction of the front aperture and laminar over the whole area of the front aperture by the use of smoke;
- Check visual if the air direction of the downflow is downwards in direction of the work surface and laminar over the whole work surface by the use of smoke.

9 Technical specifications

9.1 Physical surrounding

Transport physics		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Surrounding temperature	[°C]	From -25 up to 55	From -25 up to 55	From -25 up to 55	From -25 up to 55	From -25 up to 55
Surrounding temperature (max. 24 h)	[°C]	From -25 up to 75	From -25 up to 75	From -25 up to 75	From -25 up to 75	From -25 up to 75
Humidity	[%]	20 - 90	20 - 90	20 - 90	20 - 90	20 - 90

In use physics		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Surrounding temperature	[°C]	15 – 30	15 – 30	15 – 30	15 – 30	15 – 30
Humidity	[%]	30 - 80	30 - 80	30 - 80	30 - 80	30 - 80

9.2 General specifications

Dimensions		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Front aperture (work mode) (hxl)	[mm]	165x1190	165x1495	165x1800	165x1190	165x1800
Front aperture maximum height	[mm]	350	350	350	350	350
Exteriors dimensions without support frame without exhaust hood (lxdxh)	[mm]	1333x844x1552	1638x844x1552	1943x844x1552	1333x844x(1552 + 650)	1943x844x(1552 + 650)
Height with support frame for work height 900 [mm] without exhaust hood	[mm]	2297 (1552 + 745)	2297 (1552 + 745)	2297 (1552 + 745)	2297 (1552 + 745)	2297 (1552 + 745)
Interior dimensions (lxdxh)	[mm]	1190x605x725	1495x605x725	1800x605x725	1190x605x725	1800x605x725
Work area (lxd)	[mm]	1109x440	1414x440	1719x440	1109x440	1719x440
Mass (without frame)	[kg]	255	275	315	300	380
Exhaust connection	[mm]	Ø 250	Ø 250	Ø 250	Ø 250	Ø 250
Window		8 mm laminated glass (2 layers)	8 mm laminated glass (2 layers)	8 mm laminated glass (2 layers)	8 mm laminated glass (2 layers)	8 mm laminated glass (2 layers)

Filter		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Pre-filter	[mm]	G3 (EN 779) 1150x445	G3 (EN 779) 1460x445	G3 (EN 779) 1760x445	G3 (EN 779) 1150x445	G3 (EN 779) 1760x445
Downflow filter	[mm]	Astrocell HEPA 12P6+ 610x1220x69 (mm) H14 acc. EN 1822	Astrocell HEPA15P6 610X1524X69 (mm) H14 acc. EN 1822	Astrocell HEPA 18P6+ 610x1830x69 (mm) H14 acc. EN 1822	Astrocell HEPA 12P6+ 610x1220x69 (mm) H14 acc. EN 1822	Astrocell HEPA 18P6+ 610x1830x69 (mm) H14 acc. EN 1822
Exhaust filter	[mm]	Astrocell HEPA 4P4 457X457X69 (mm) H14 acc. EN 1822	Astrocell HEPA 6P6 610X610X69 (mm) H14 acc. EN 1822	Astrocell HEPA 7P6 762x610x69 (mm) H14 acc. EN 1822	Astrocell HEPA 4P6 457x610x69 (mm) H14 acc. EN 1822	Astrocell HEPA 7P6 762x610x69 (mm) H14 acc. EN 1822
First HEPA filter					HEPA V-pleats Type PB-H14 H14 acc. EN 1822 (8 pieces)	HEPA V-pleats Type PB-H14 H14 acc. EN 1822 (12 pieces)

Performance		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Sound level (according to ISO 11201)	[dB A]	<57	<60	<56	<60	<60
Average downflow speed (in work mode)	[m/s]	0,36 ±0,05 *1	0,36 ±0,05 *1	0,36 ±0,05 *1	0,36 ±0,05 *1	0,36 ±0,05 *1
Average downflow speed (in standby mode)	[m/s]	0,10 - 0,20	0,10 - 0,20	0,10 - 0,20	0,10 - 0,20	0,10 - 0,20
Average inflow speed in top of front aperture (in work mode)	[m/s]	0,28 *2	0,28 *2	0,28 *2	0,28 *2	0,28 *2
Average inflow speed in whole front aperture (in work mode)	[m/s]	> 0,5 *2	> 0,5 *2	> 0,5*2	> 0,5 *2	> 0,5 *2
Exhaust airflow (work mode)	[m^3/h]	400 +/- 25	500 +/- 25	600 +/- 25	400 +/- 25	600 +/- 25

*1 As where no individual measurement should differ more than 20% from the mean.

*2 The average inflow velocity measured at the top of the front aperture should be at least 0,28 m/s, the overall average inflow velocity should be at least 0,40 m/s (EN 12469:2000).

Electrics		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Power connection	[V] [Hz]	230 +/- 5% 50	230 +/- 5% 50	230 +/- 5% 50	230 +/- 5% 50	230 +/- 5% 50
Needed main fuse box security	[A]	16	16	16	16	16
J6: Alarm, potential free contact	[V]	Max. 48	Max. 48	Max. 48	Max. 48	Max. 48
	[A]	Max. 1	Max. 1	Max. 1	Max. 1	Max. 1
Electrical insulation		Class 1	Class 1	Class 1	Class 1	Class 1
Electrical safety IEC 61000-4-11 Installation cat.		Class A II	Class A II	Class A II	Class A II	Class A II
Power sockets	$U_{max.}$[V] I_{max} [A] $P_{max.}$[W]	230 3,15 725	230 3,15 725	230 3,15 725	230 3,15 725	230 3,15 725
Power consumption in standby mode (with light switched off) excl. maximum power socket	P [J/s,W] I [A]	303 1,3	513 2,2	568 2,5	533 2,3	766 3,3
Power consumption in work mode (with light switched on) excl. maximum power socket	P_{nom} [J/s,W] $I_{nom.}$ [A]	552 2,4	709 3	877 3,8	805 3,5	950 4,2
Power consumption in work mode (with light switched on) incl. maximum power socket	P_{nom} [J/s,W] $I_{nom.}$ [A]	1277 5,6	1434 6,3	1600 7	1530 6,7	1675 7,3
Power consumption in max mode fan (with light switched on) excl. maximum power socket	P_{max} [J/s,W] $I_{max.}$[A]	725 3,2	992 4,3	1036 4,5	1613 7	1956 8,5
Power consumption in max mode fan (with light switched on) incl. maximum power socket	P_{max} [J/s,W] $I_{max.}$[A]	1450 6,3	1717 7,5	1761 7,7	2338 10,2	2681 11,7

Lighting		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
TL-High output		2x	2x	2x	2x	2x
Colour		White – Nr.840	White – Nr.840	White – Nr.840	White – Nr.840	White – Nr.840
Diameter	[mm]	Ø26	Ø26	Ø26	Ø26	Ø26
Length	[mm]	970	1200	1500	970	1500
Power	[W]	2x 36	2x 36	2x 58	2x 36	2x 58
Intensity (mean) +/- 5%	[Lux]	1000	1100	1550	1000	1550

Fuses I/O Board		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
F1: PCB; 24 [V]	[A] T	0,5	0,5	0,5	0,5	0,5
F2: Option	[A] T	3,15	3,15	3,15	3,15	3,15
F3: Lighting	[A] T	1,6	1,6	1,6	1,6	1,6
F4: UV	[A] T	0,5	0,5	0,5	0,5	0,5
F6: Socket 1	[A] T	3,15	3,15	3,15	3,15	3,15
F7: Fan	[A] T	8	8	8	8	8
F8: PCB	[A] T	1,6	1,6	1,6	1,6	1,6
F9: PCB	[A] T	1,6	1,6	1,6	1,6	1,6

Fuses option board		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
F1: Optional fan	[A] T	Max. 8	Max. 8	Max. 8	Max. 8	Max. 8
F2: Optional	[A] T	Max. 8	Max. 8	Max. 8	Max. 8	Max. 8
F3: Charge current	[A] T	1	1	1	1	1

Control		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Software version I/O Board		2.2	2.2	2.2	2.2	2.2
Software version Interface		4.9	4.9	4.9	4.9	4.9

Options:

UV		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Type		UV-C	UV-C	UV-C	UV-C	UV-C
Power	[W]	30	30	30	30	30
Length UV-wave	[nm]	253	253	253	253	253
Diameter	[mm]	Ø 28	Ø 28	Ø 28	Ø 28	Ø 28
Length	[mm]	908,8	908,8	908,8	908,8	908,8

Gas valve		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Voltage	[V] DC	24	24	24	24	24
Current	[A]	0,4	0,4	0,4	0,4	0,4

Bunsen burner		**EF 4**	**EF 5**	**EF 6**	**EF/B 4**	**EF/B 6**
Voltage	[V] DC	9	9	9	9	9
Power	[W]	2	2	2	2	2

See also *Appendix XI: Required specifications on page 89* and *Appendix XII: Part list critical components on page 91*.

10 Trouble shooting

Fault	Cause	Remedy
No power on socket of the cabinet	Socket is not activated	Activate socket on display push on 2
	Fuse is broken	Replace the fuse
UV button is not visible on display	UV equipment is not installed	x
	Option UV is not installed	UV option has to be programmed please contact your service organization
UV is not working	Window not down	Window completely downwards
Gas button is not visible on display	Gas equipment is not installed	x
	Option gas is not installed	UV option has to be programmed please contact your service organization
Gas is not working	Fan in off position	Fan in work mode
	High flow alarm/ Alarm in safe/night – mode.	
FL-light is not working	Contacts of the FL are not locking in the power connections	Turn the FL-light slightly
	UV light is on	Switch of the UV light
Cabinet is locked	User code must be entered	Enter the user code (or de-activate the user code see *§5.14 Change the user code on page 45*).

Appendix I: Support frames EF & EF/B

For every type of cabinet from the EF-series and the EF/B series a specific support frame is available.

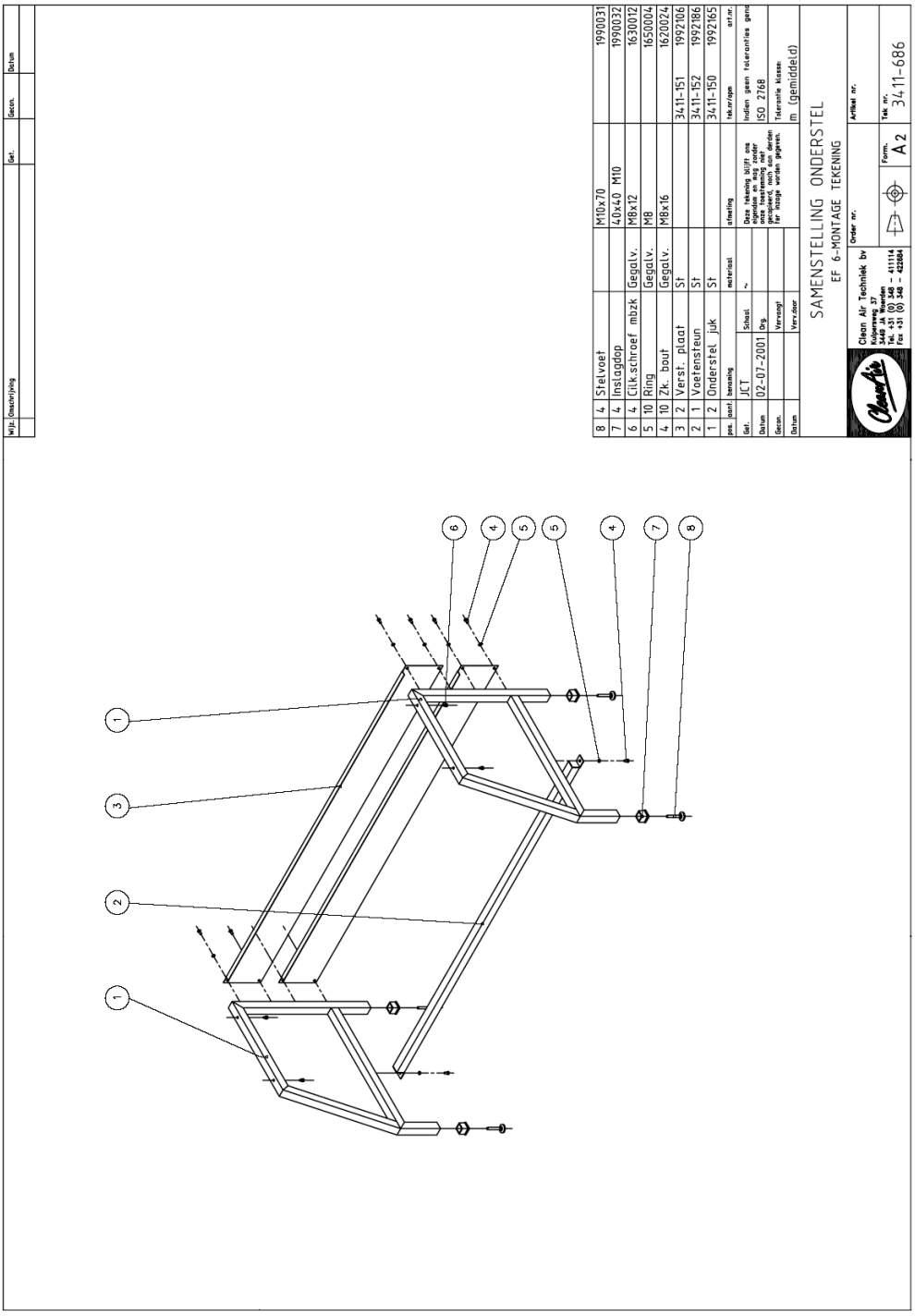

SAMENSTELLING ONDERSTEL
EF 6-MONTAGE TEKENING
Clean Air Techniek bv
Form. A2
Tek. nr. 3411-686
8 4 Stelvoet M10x70 1990031
7 4 Insteekdop 40x40 M10 1990032
6 4 Cilk.schroef mbzk Gegalv. M8x12 1630012
5 10 Ring Gegalv. M8 1650004
4 10 Zk. bout Gegalv. M8x16 1620024
3 2 Verst. plaat St 3411-151 1992106
2 1 Voetensteun St 3411-152 1992186
1 2 Onderstel juk St 3411-150 1992165

Figure 35 Example of a support frame (EF 6)

Appendix II: Disinfection

Your Biological Safety Cabinet has a "built-in" disinfection software program.
This program knows a number of varieties, which are dependent on the installed options in the security cabinet, and the manner the cabinet has been installed.
The disinfection software of the control print is only available in version number 2.4 270307 or higher. **The disinfection software itself is no disinfection!** The Biological Safety Cabinet can work according to automatic disinfection software only if this has been installed.
Consult your order confirmation for the installed options or contact Clean Air Techniek B.V.
In case additional information about disinfection is needed, please contact Clean Air Techniek B.V.
Check the website of Clean Air Techniek B.V. (www.cleanair.eu, Products, Downloads) for more detailed information about disinfection.

Appendix III: Replacement of the HEPA filters

Under normal circumstances, the life span of a HEPA filter comprises several years. However, it will become clogged up gradually, until there is no longer a proper flow-through and the filter has to be replaced.
Replace both the downflow filter and the exhaust filter at the same time. This needs to be done since the total amount of air in the cabinet is based on filter proportion.
In cabinets of the EF/B-series the first HEPA filters will be clogged up faster than the downstream positioned downflow and exhaust HEPA filters.

	BIOLOGICAL DANGER **BE CAREFUL!!** Before starting service with the cabinet a written declaration "that the cabinet is decontaminated" must be present. The responsible person (laboratory supervisor) will decide if the cabinet has to be decontaminated so that when servicing the installation and the HEPA-filters there is no danger for the service engineer, labour personnel, the laboratory and the surroundings of the cabinet. If necessary disinfect the installation. For more information *Appendix II: Disinfection on page 67*.
	CYTOTOXIC DANGER When cytotoxics are used, see *§2.5 Cytotoxic danger (EF/B only) on page 10.* Only the responsible safety officer (biological safety officer or the responsible examiner) can decide if this procedure is valid or not. Additional standard operation procedures can be necessary.

The valid procedures for the disposal of possible contaminated material must always be followed. When the service engineer thinks this is not enough this will be discussed with the responsible person so that enough precautions can be made.

Clean Air Techniek B.V. strongly recommends specially trained technicians to carry out filter exchange. Certified service organizations are recommended. At all times keep to the service and maintenance procedures from Clean Air Techniek B.V.

1. When does a HEPA filter need to be replaced?

Under normal circumstances the serviceable life time of a HEPA filter is several years (mostly between 5 and 10 years). The filter should be replaced whenever the air velocity and/or the filter Integrity are no longer in compliance with the EN-12469:2000. The cabinet has a microprocessor that is automatically regulating the fan speed to compensate for main power fluctuations and filter pollution.

Downflow HEPA filter

The HEPA filter needs to be replaced when the HEPA filter integrity is not within specifications and/or when it is not possible to adjust the air velocity according the specifications.

For the downflow HEPA filter the following applies:
- The downflow velocity of the cabinet must have an average air velocity of 0,36 +/- 0,02 m/s, measured at 10 cm above the bottom edge of the sliding window (in work position). None of

the measured values should deviate more than 20% from the average value. See *Appendix V: Measuring method air velocities on page 76* for more specifications.
- In case HEPA filter Integrity is measured with a photometer and DOP, EMERY 3004 or DEHS as test aerosol, then the maximum local penetration should not exceed 0,01%.
  If the required Integrity cannot be met then it is allowed to repair up to 5% of the surface area of the HEPA filter.
  (Alternative method: In case HEPA filter Integrity is measured with a particle counter then local penetration should be ≤ 0.05%. When the overall Integrity is measured the penetration should not exceed 0,005%).

Exhaust HEPA filter

The HEPA filter needs to be replaced when the HEPA filter integrity is not within specifications and/or when it is not possible to adjust the air velocity according the specifications.

For the exhaust HEPA filter the following applies:
- The average velocity of the air inflow should be > 0,50 m/s. The air velocity, measured perpendicular to the air flow at the top side of the work aperture, should be ≥ 0,28 m/s.
- In case HEPA filter Integrity is measured with a photometer and DOP, EMERY 3004 or DEHS as test aerosol, then the maximum local penetration should not exceed 0,01%.
  If the required Integrity cannot be met then it is allowed to repair up to 5% of the surface area of the HEPA filter.
  (Alternative method: In case HEPA filter Integrity is measured with a particle counter then local penetration should be ≤ 0.05%. When the overall Integrity is measured the penetration should not exceed 0,005%).

The first, V-shaped HEPA filters (EF/B)

The HEPA filter needs to be replaced when the HEPA filter integrity is not within specifications and/or when it is not possible to adjust the air velocity according the specifications.

For the first, V-shaped HEPA filters (only relevant to the EF/B class II cabinets) the following applies:
- The downflow velocity of the cabinet must have an average air velocity of 0,36 +/- 0,02 m/s, measured at 10 cm above the bottom edge of the sliding window (in work position). None of the measured values should deviate more than 20% from the average value. See *Appendix V: Measuring method air velocities on page 76* for more specifications.
- The average velocity of the air inflow should be > 0,50 m/s. The air velocity, measured perpendicular to the air flow at the top side of the work aperture, should be ≥ 0,28 m/s.
- In case HEPA filter Integrity is measured with a photometer and DOP, EMERY 3004 or DEHS as test aerosol, then the maximum local penetration should not exceed 0,01%.
  If the required Integrity cannot be met then it is allowed to repair up to 5% of the surface area of the HEPA filter.
  (Alternative method: In case HEPA filter Integrity is measured with a particle counter then local penetration should be ≤ 0.05%. When the overall Integrity is measured the penetration should not exceed 0,005%).

2. Replacement of HEPA filters

Make sure that the cabinet has been properly decontaminated so as to ensure that no danger exists for the service engineer, the laboratory personnel and the environment.
If the customer has a special procedure for the disposal of contaminated material, then this should be followed. In case the service engineer does not think that this is sufficient, then proper precautions should be made in consultation with the person responsible for the safety cabinet.
If there is no special procedure it is best to wear at least gloves and the protective clothing normally worn during work with the safety cabinet. It is also advised to have a breathe protection e.g. with a semi-facial mask with HEPA filters.

Take note of this warning and advice since these activities are potentially harmful!!

Replacement of the downflow HEPA filter

For replacement of the downflow HEPA filter the following procedure must be followed:

Supplies needed:

- Plastic bag with closure (minimum measurement depends on the volume of the HEPA filter);
- Two pairs of gloves;
- Semi-facial mask with HEPA filters;
- Tools (knife, spanner or socket wrench, alien key);
- Filter exchange set;
- Tape;
- Chemical disposal container or chemical disposal procedure.

Removing the old downflow HEPA filter

- Decontaminate the cabinet;
- Switch off the installation and plug out the power plug;
- Put on the gloves and keep an extra pair ready for use;
- Put on your breathe protection e.g. with a semi-facial mask with HEPA filters;
- Remove the aerofoil;
- Put the window in its disinfection position;
- Open the top hood;
- Remove the safety plate for the electronics;
- Remove the front panel (remove the screws);
- Unloose the bolts of the pressure bars and remove the bars;
- Position the "Filter change set";
- Lifting up the plenum step by step;
- Loosen the HEPA filter;
- Take HEPA filter out of the cabinet and put it into an appropriate plastic bag;
- Seal the plastic bag airtight;
- Remove the gloves and put them in the appropriate container.

Position the new downflow HEPA filter

- Unpack the new filter, check specifications and register the serial number and specifications;
- Filter certificate has to be stored on a safe place;
- Put Vaseline on the seal of the HEPA filter (both sides);
- Position the HEPA filter (take care for possible damage of the sealings!);
- Reposition the plenum downwards and remove the "filter exchange set";
- Reposition the pressure bars and fasten the bolts;
- Reposition the front panel;
- Reposition the safety plate for the electronics;
- Put off your gloves and put these in an appropriate bag;
- Hinge the top hood down;
- Put the aerofoil back in position;
- Put the window into working position;
- Place the power plug in the supply socket and switch on the installation;
- Perform an Integrity test according to the procedure described in *Appendix IV: Efficiency test of the HEPA filters on page* 74.

Replacement of the exhaust HEPA filter

For replacement of the exhaust HEPA filter the following procedure must be followed:

Supplies needed:

- Plastic bag with closure (minimum measurement depends on the volume of the HEPA filter);
- Two pairs of gloves;
- Semi-facial mask with HEPA filters;
- Tools (knife, spanner or socket wrench, alien key);
- Tape;
- Chemical disposal container or chemical disposal procedure.

Removing the old exhaust HEPA filter

- Decontaminate the cabinet;
- Switch off the installation and plug out the power plug;
- Put on the gloves and keep an extra pair ready for use;
- Put on your breathe protection e.g. with a semi-facial mask with HEPA filters;
- In case the cabinet is connected to an external exhaust channel, disconnect the cabinet from this exhaust channel;
- Remove the nuts support plate of the exhaust HEPA filter;
- Remove the support plate of the exhaust HEPA filter;
- Remove the HEPA filter;
- Put the HEPA filter in an appropriate bag;
- Seal the plastic bag airtight;
- Remove the gloves and put them in the appropriate container.

Position the new exhaust HEPA filter

- Unpack the new filter, check specifications and register the serial number and specifications;
- Filter certificate has to be stored on a safe place;
- Put Vaseline on the seal of the HEPA filter (both sides);
- Position the HEPA filter (take care for possible damage of the sealings!);
- Fasten the support frame;
- In case the cabinet was connected to an external exhaust channel, connect the cabinet to this exhaust channel;
- Put off your gloves and put these in an appropriate bag;
- Place the power plug in the supply socket and switch on the installation;
- Perform an Integrity test according to the procedure described in *Appendix IV: Efficiency test of the HEPA filters on page 74.*

Replacement of the first (V-shaped) HEPA filter (EF/B only)

For replacement of the first HEPA filter the following procedure must be followed:

Supplies needed:

- Plastic bag with closure (minimum measurement depends on the volume of the HEPA filter);
- Gloves (4 pair for EF/B 4, 6 pair for EF/B 6);
- Semi-facial mask with HEPA filters;
- Tools (knife, spanner or socket wrench, alien key);
- Tape;
- Chemical disposal container or chemical disposal procedure.

Starting

- Decontaminate the cabinet;
- Switch on the installation;
- Make sure that the window is the working position and that there are no alarms;
- Put on new gloves and keep an extra pair ready for use;
- Put on your breathe protection e.g. with a semi-facial mask with HEPA filters;
- Hinge the worktop to the back partition;
- Remove the pre-filter (see *§8.2 Replacement of the pre-filter on page 56*);
- Remove the wire mesh frame of the pre-filter.

Per filter pressure frame (containing 2 HEPA filters) the following procedure has to repeated. (for the EF/B 4 with 4 pressure frames (containing 8 HEPA filters) this procedure has to be repeated 4 times. For the EF/B 6 this procedure has to be repeated 6 times (6 pressure frames and 12 HEPA filters).

Removing the old 1st HEPA filter sections of a pressure frame

- Remove the pressure frame of a filter section;
- Seal both the openings of the two HEPA filters with DUCT-tape or similar, in order to isolate the contaminated side of these two HEPA filters from the environment;
- Remove the first HEPA filter and put it in an appropriate plastic bag;
- Fold back the edge of the plastic bag, not touching the inner side of the plastic bag;
- Press the air out of the bag (with its opening still in the working space);
- Seal the plastic bag airtight;
- Remove the plastic bag and place it in an appropriate container;
- Remove the second HEPA filter and put it in an appropriate plastic bag;
- Fold back the edge of the plastic bag, not touching the inner side of the plastic bag;
- Press the air out of the bag (with its opening still in the working space);
- Seal the plastic bag airtight;
- Remove the plastic bag and place it in an appropriate container;
- Remove the gloves and put them in the appropriate container.

Position the new 1st HEPA filter section of a pressure frame

- Put on new gloves;
- Place two new HEPA filters. Take care that the top side of the filters are level with the top side of the filter casing. If a filter is lower then tape should be applied to the bottom of the filter to make sure that the topsides of both filter and filter casing are level;
- Place the pressure frame back;

Start again with procedure for *Removing the old 1st HEPA filter sections of a pressure* frame *on page 73* with the next 1st HEPA filters.

- Place the pre-filter wire mesh, the pre-filter itself and the work top back.

Integrity test

- Perform an Integrity test according to the procedure described in *Appendix IV: Efficiency test of the HEPA filters on page 74.*

Appendix IV: Efficiency test of the HEPA filters

	BIOLOGICAL DANGER **BE CAREFUL!!** Before starting service with the cabinet a written declaration "that the cabinet is decontaminated" must be present. The responsible person (laboratory supervisor) will decide if the cabinet has to be decontaminated so that when servicing the installation and the HEPA-filters there is no danger for the service engineer, labour personnel, the laboratory and the surroundings of the cabinet. If necessary disinfect the installation. For more information *Appendix II: Disinfection on page 67*.
	CYTOTOXIC DANGER When cytotoxics are used, see *§2.5 Cytotoxic danger (EF/B only) on page 10.* Only the responsible safety officer (biological safety officer or the responsible examiner) can decide if this procedure is valid or not. Additional standard operation procedures can be necessary.

Requirements

According to the norm EN 12469:2000 HEPA filters must meet a few requirements.

Efficiency test by means of a particle counter

The downflow, exhaust and first filter must have an efficiency of 99,995% . A locally measured value can be a factor 10 higher, ≤ 0.05%.

Efficiency test with a photometer

The downflow, exhaust and first filter must have an efficiency of 99,99%. Any locally measured value must be ≤ 0.01%.

When a HEPA filter does not meet the EN 12469:2000, it is allowed to repair it. However the surface of the reparation must not be more than 5% of the total surface of the HEPA filter.

When this does not have sufficient effect the HEPA filter must be replaced as described in *Appendix III: Replacement of the HEPA filters on page 68*.

Test aerosol

In an EF cabinet, the test aerosol for the downflow and exhaust filter can be added through the working area (*Figure 36,* Pos. A). The 100% measure point upstream concentration for the downflow filter as well as the exhaust filter is positioned under the work area (*Figure 36,* Pos. B and *Figure 38*). The downflow filter and the exhaust filter can be scanned (*Figure 36,* Pos. F and D).

In an EF/B cabinet, the test aerosol for the first HEPA filter can be added through the working area (*Figure 37,* Pos. A) for each HEPA filter section separately.

Test aerosol for the downflow and exhaust filters can be added on the special connection on the front of the first HEPA filter section (*Figure 39)*. The 100% measure point upstream concentration for the downflow filter as well as the exhaust filter is positioned under the work area (*Figure 37,* Pos. B and *Figure 38*). The downflow filter and the exhaust filter can be scanned (*Figure 37,* Pos. F and D).

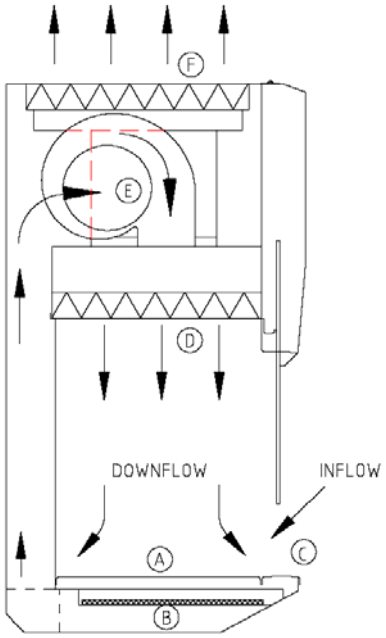


Figure 36 Sectional view EF

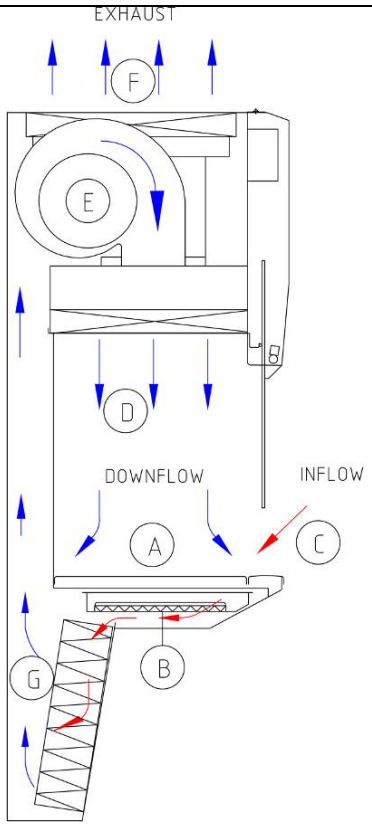


Figure 37 Sectional view EF/B

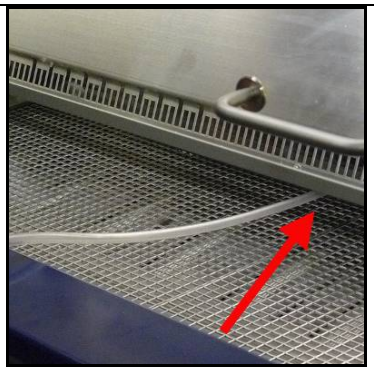


Figure 38 100% measure point exhaust and downflow for EF and EF/B

Figure 39 Input test aerosol for downflow and exhaust HEPA filters for EF/B

Appendix V: Measuring method air velocities

	BIOLOGICAL DANGER **BE CAREFUL!!** Before starting service with the cabinet a written declaration "that the cabinet is decontaminated" must be present. The responsible person (laboratory supervisor) will decide if the cabinet has to be decontaminated so that when servicing the installation and the HEPA-filters there is no danger for the service engineer, labour personnel, the laboratory and the surroundings of the cabinet. If necessary disinfect the installation. For more information *Appendix II: Disinfection on page 67*.
	CYTOTOXIC DANGER When cytotoxics are used, see *§2.5 Cytotoxic danger (EF/B only) on page 10.* Only the responsible safety officer (biological safety officer or the responsible examiner) can decide if this procedure is valid or not. Additional standard operation procedures can be necessary.

The measurement of air velocities in the cabinet is performed according to the EN 12469:2000.

Air velocities downflow

- Switch on the cabinet;
- Measure the airspeeds according to the pattern of *Figure 43* with an anemometer at a height of 100 mm above the front opening (See *Figure 42*). This measurement must be done for at least one minute on each position.

Air velocities inflow[1]*

- Switch on the cabinet;
- Measure with an anemometer the average air velocity in the inflow, according to the pattern of Figure 41 and with probe position as shown in *Figure 40*.
- Multiply these numbers with the surface of the exhaust opening: the result is the air volume through the safety cabinet;
- Divide the air velocity through the surface of the front opening: the result is the average value of the inflow air speed.

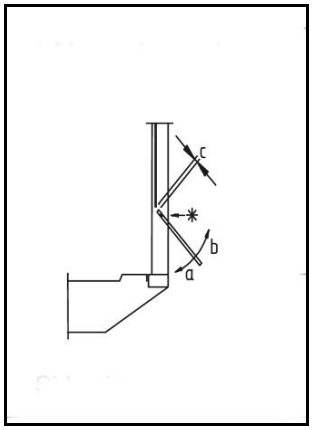


Figure 40 Side view for measuring level inflow

*Measuring probe

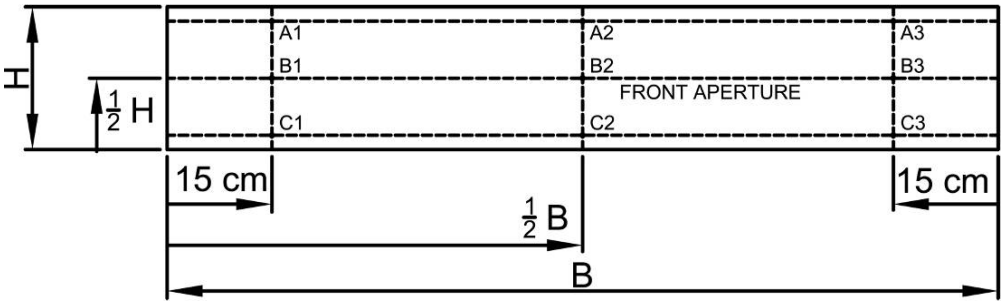


Figure 41 Measuring points inflow

(H = Height, B = Broad)

*[1] The average inflow velocity at the top of the front aperture is measured and can be read in the display. The minimal required value of the average inflow velocity measured at the top of the front aperture is given in chapter 9.2 on page 61. Measuring these most critical measured values directly under the window ensures that the overall average inflow velocity is according to the guidelines of the EN12469:2000 (Annex H table H1 Mean inflow velocity to achieve operator protection > 0,4 m/s).

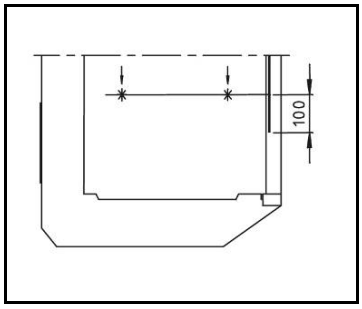


Figure 42 Side view for measuring level downflow

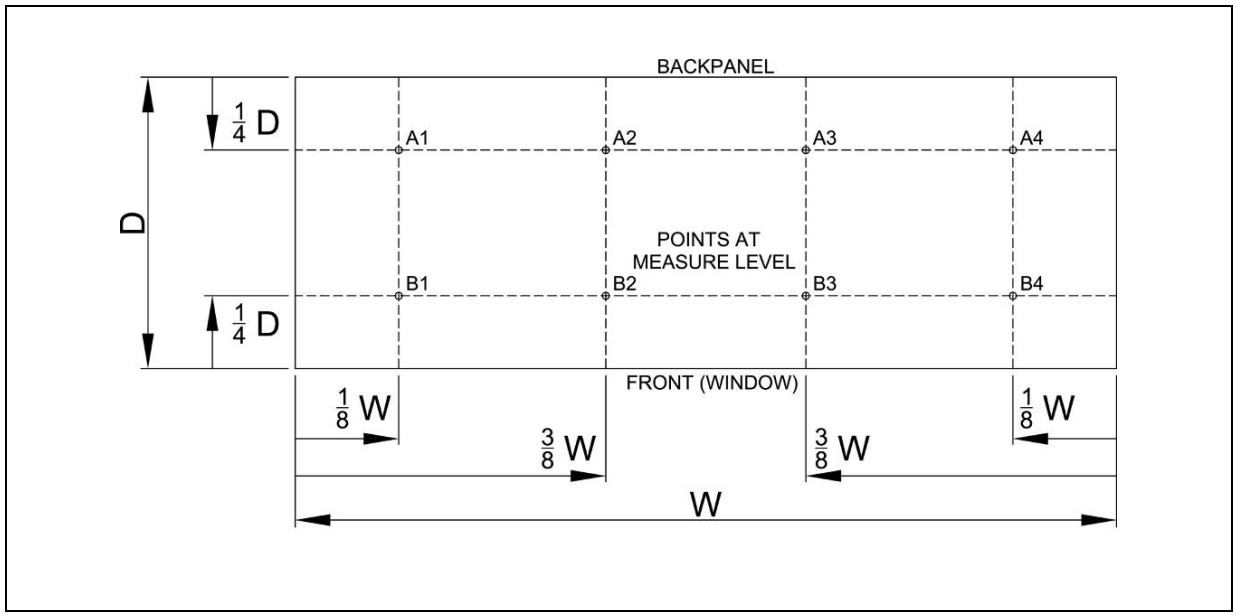


Figure 43 Measuring points downflow

(W = Width, D = Depth)

Appendix VI: Lay-out boards

Interface board

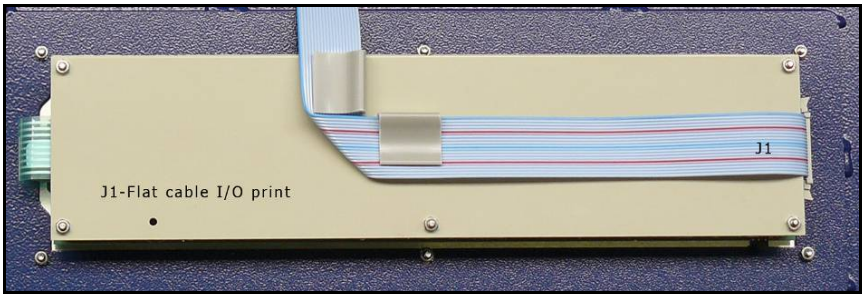


Figure 44 Interface board

Control board

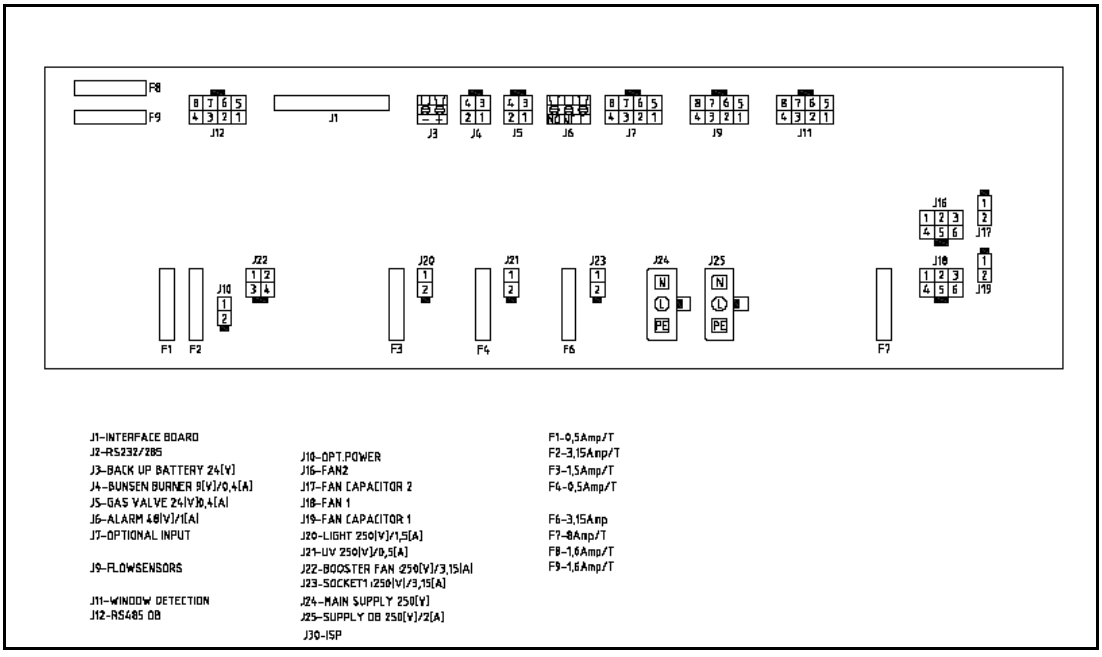
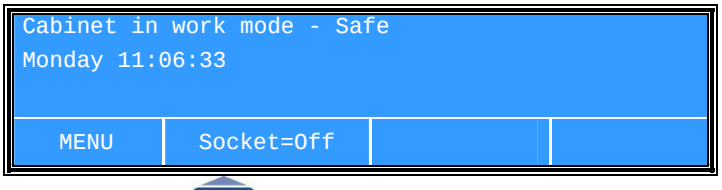
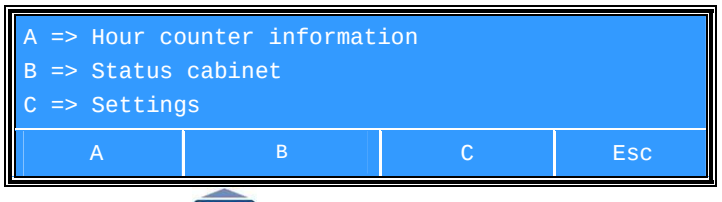
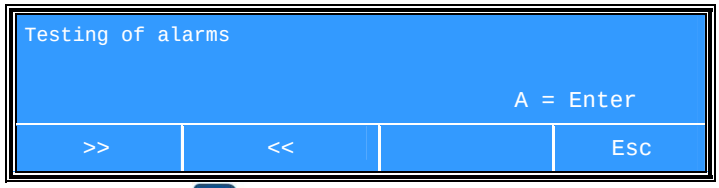
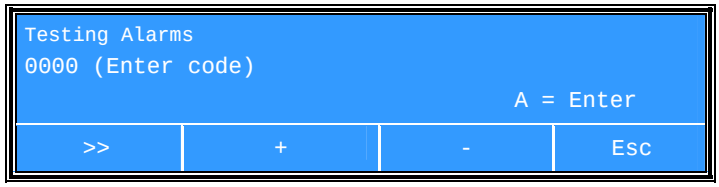
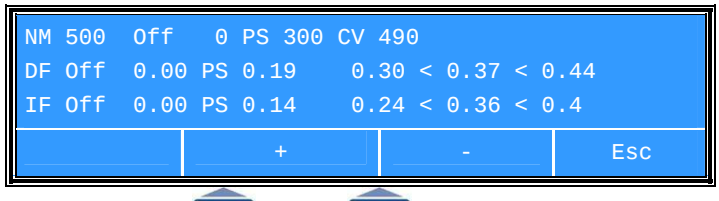


Figure 45 Control board E010001 rev F

Appendix VII: Alarm-test procedure

(Authorized personnel only)
To test the alarm limits, the automatic fan control must be overruled, so the fan power can be set by hand. The entire state of the cabinet will stay unchanged, except for the fan-power. The required test-code is 7733.
In this state, each 30 second, two short audible signals will be heard, to be remembered at the initial unsafe mode. After 30 minutes after the last button is touched, the fan returns to its work mode.

Alarm-test procedure

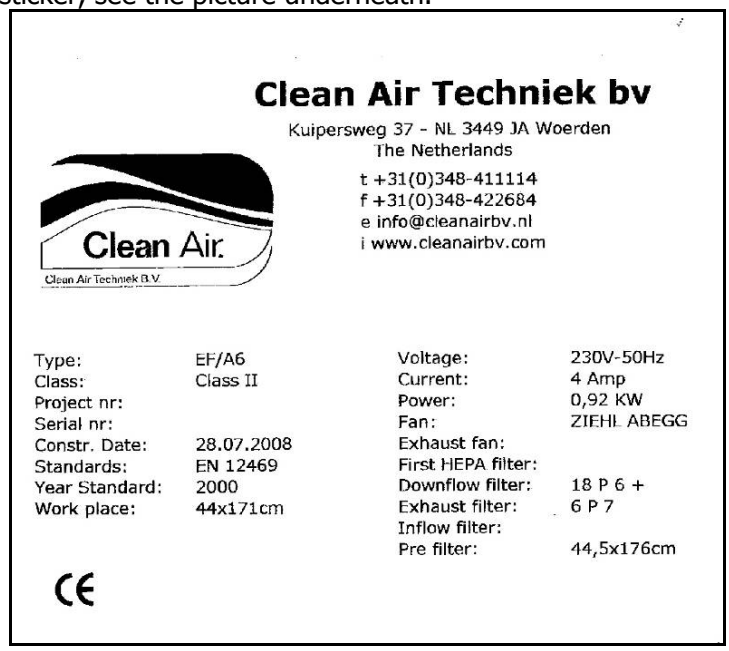
1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu).  • Push button 3 (C).
2	Alarm test	• Push 3x button 1 (>>).  • Push button A.  • Enter the test code: 7733. • Push button A.
	Alarm test settings (NM = Normal mode, PS = Power save mode, DF = Downflow, IF = Inflow, *[1] CV = Current value)	 • Push button 2 (+) or 3 (-) in order to adjust the fan speed. Value CV will change.

Middle numbers are the actual values from the airspeed indicators, which are changeable with the use of the buttons 2 (+) and 3 (-).
First and last values are the set up alarm borders (for example: Downflow DF: lowest level is 0.30 m/s, highest level is 0.44 m/s and the actual value for downflow velocity is 0.37 m/s).
The fan speed is shown in tenths of percents (0 = min. and 1000 = max.).

*[1] The average inflow velocity at the top of the front aperture is measured and can be read in the display. The minimal required value of the average inflow velocity measured at the top of the front aperture is given in chapter 9.2 on page 61. Measuring these most critical measured values directly under the window ensures that the overall average inflow velocity is according to the guidelines of the EN12469:2000 (Annex H table H1 Mean inflow velocity to achieve operator protection > 0,4 m/s).

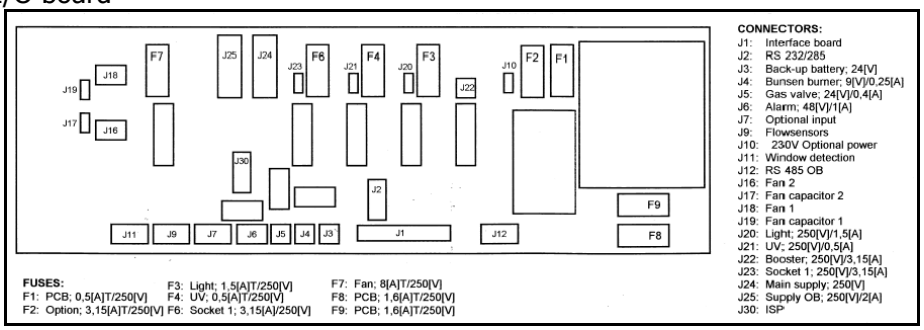
Appendix VIII: Stickers

1) Sticker cabinet type. This sticker can be found on the outside, underneath the cabinet. For an example of the sticker, see the picture underneath.



2) Sticker filter type. This sticker can be found behind the top hood and on top of the cabinet (for downflow filter and exhaust filter).

3) Sticker I/O board



4) TÜV sticker

5) Work mode

6) Electro

7) Biohazard

Biohazard sticker is positioned on the cabinet. The sticker has to positioned in sight of the operator.

8) Cytotoxic(only EF/B)

This sticker is delivered with the cabinet. Depending on the work that is done on the cabinet the customer must decide whether there are any Cytotoxic hazards or not. In case of any Cytotoxic hazards the sticker has to positioned on the cabinet above the front aperture (According to DIN 12980: 2005).

9) Cytotoxic (only EF/B)

This sticker is delivered with the cabinet. Depending on the work that is done on the cabinet the customer must decide whether there are any Cytotoxic hazards or not. In case of any Cytotoxic hazards the sticker has to positioned on the cabinet above the front aperture (According to DIN 12980: 2005).

Appendix IX: Information installed options

Exhaust hood

The exhaust hood is used in case the cabinet is connected to an external system.
On the hood a thimble, a booster fan or duct can be positioned.
The exhaust hood creates an extra barrier and produces extra air resistance.
This extra resistance is in most of the cases compensated by additional external fan power.
In case the exhaust hood is not connected to an external system as described above, the exhaust hood only produces extra resistance and will reduce the airflow in the exhaust chamber. In this case it is recommended to remove the exhaust hood or contact Clean Air Techniek B.V. for advice.
For the same reason the exhaust channel may not be obstructed.

Installed options microprocessor

This chapter describes the codes from *§5.13 Information about the installed options on page 41.* Menu B from the microprocessor.

- Start up in "Menu-Display",
- Push button 1 (Menu),
- Push button 2 (B),
- Push button 1 (=>) for screen I,
- Push button 1 (=>) for screen II,
- Push button 1 (=>) for screen III.

Screen I Installed options – Option

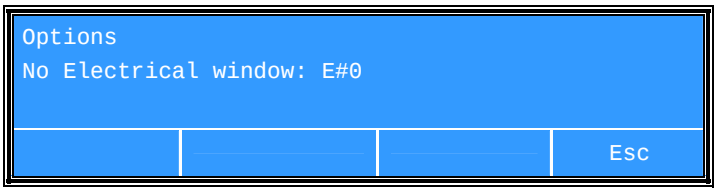


Figure 46 Example of screen I

Explanation of the codes from the menu:
- #E0: no electrical window;
- #E1: electrical window; no functionality for fan; (not available for EF en EF/B)
- #E2: work mode, if cabinet is switched on;
- #C3 = relay K2 on option print;

Screen II Installed options – relays

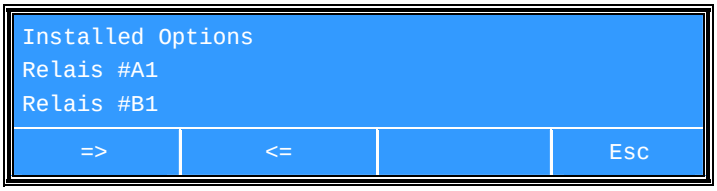


Figure 47 Example of screen II

Overview functions of relay K8, #A1-A12

Alarm #A1 - #A12 relay switching K8, on output J5 at the IO print:
Set up from #A1 until #A12:

A1 Relay ON = A & (HD * LD * HI * LI) DEFAULT
A2 Relay ON = A & (HD * LD * HI * LI * R)
A3 Relay ON = W & (HD * LD * HI * LI)
A4 Relay ON = W & (HD * LD * HI * LI * R)
A5 Relay ON = W & (HD * LD)
A6 Relay ON = A & (HD * LD)
A7 Relay OFF = A & (HD * LD * HI * LI)
A8 Relay OFF = A & (HD * LD * HI * LI * R)
A9 Relay OFF = W & (HD * LD * HI * LI)
A10 Relay OFF = W & (HD * LD * HI * LI * R)
A11 Relay OFF = W & (HD * LD)
A12 Relay OFF = A & (HD * LD)

Explanation codes used above:
W = Working mode, S = Save mode, A = Cabinet on and spare mode, HD = High downflow alarm, LD = Low downflow alarm, HI = High inflow alarm, LI = Low inflow alarm, R = Window alarm, & = AND function, * = OR function.

Functions are factory adjustments and cannot be changed by the user.

Overview functions of relay K3, #B1-B5

Alarm #B1 - #B5 relay switching K3, on output J22 at the IO print:

- #B1: the K3 relay is activated if the main fan is switched on (working mode / saving mode);
- #B2: the K3 relay is activated if the main fan is on half speed mode (saving mode);
- #B3: the K3 relay is activated if the main fan is in the working mode;
- #B4: the K3 relay is activated if the option Disinfection in the menu is chosen;
- #B5: the K3 relay is activated if there is an alarm from the analogue inputs.

Overview functions of relay K2, #C1-C5

Alarm #C1 - #C5 relay switching K2, on output J14 at the Option print:

- #C1: the K2 relay is activated if the main fan is switched on (working mode/ saving mode);
- #C2: the K2 relay is activated if the main fan is on half speed mode (saving mode);
- #C3: the K2 relay is activated if the main fan is in the working mode;
- #C4: the K2 relay is activated if in the menu is chosen for the option Disinfection;
- #C5: the K2 relay is activated if there is an alarm from the analogue inputs.

Screen III Analogue inputs (only if installed)

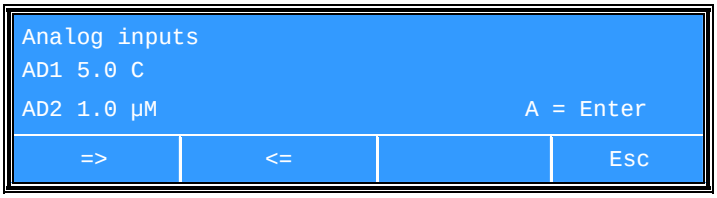


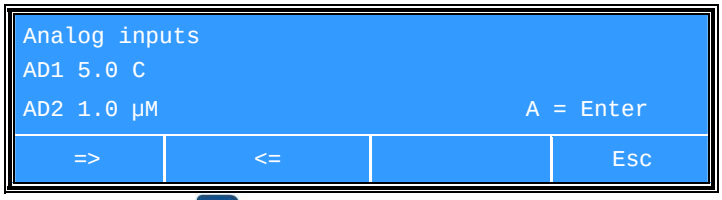
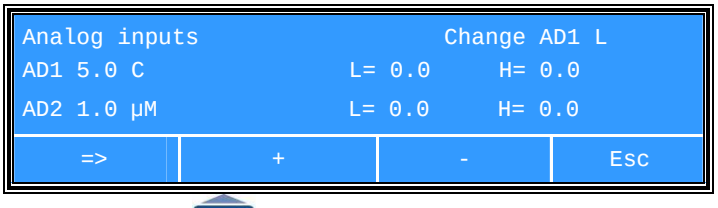
Figure 48 Example of screen III

Analogue inputs can be used to program alarm settings for e.g.:
- temperature (°C) of working surface;
- temperature (°C) of work area;
- particle counters (ppm);
- relative humidity (%);
- pressure (Pa) in plenum.

If alarm limits are exceeded, an alarm will sound as short beeps with intervals.

To install alarm limits, start from the menu as described in *§5.13 Information about the installed options on page 41*.

(The display only shows when the options are installed):

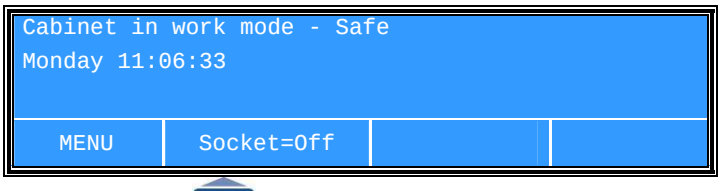
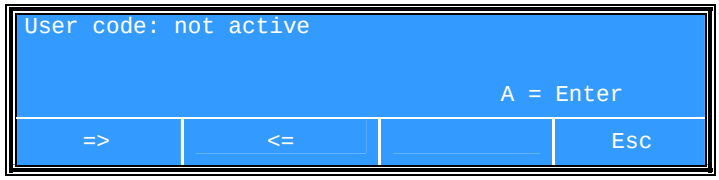
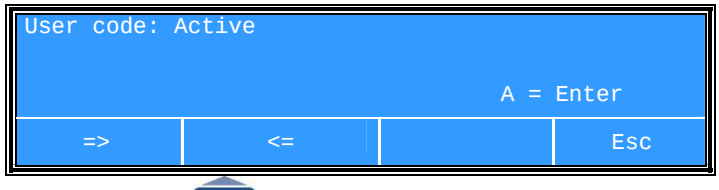
1	Starting from screen III	 • Push button A.
2	Settings for High and Low Alarm	 • Push button 1 (=>). • Choose the required limits (L=Low, H=High) for AD1 and AD2 using button 2 (+) and 3 (–). • Push button 4 (Esc) to confirm the settings and to go back to the starting menu.

An alarm can be transferred, depending on the code:
- #B5, through relay K3;
- #C5, through relay K2 (option print).

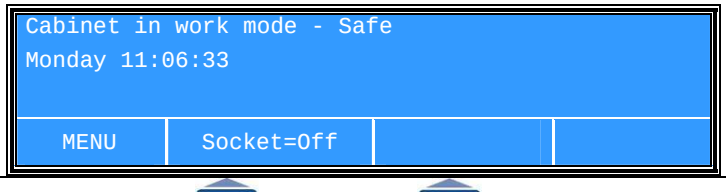
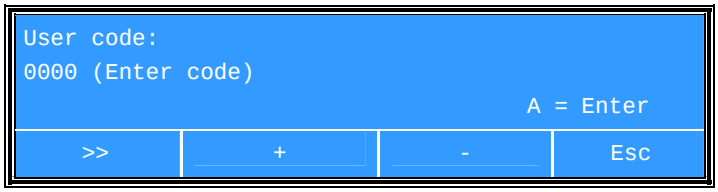
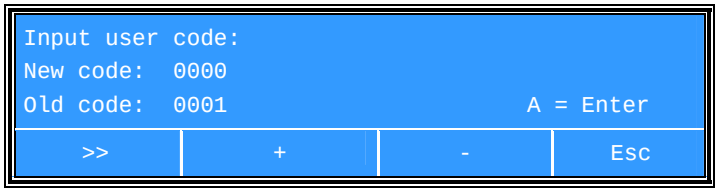
Appendix X: User code

Activating the user code

The function "User code Active/not active" makes it possible to lock the control of the installation. To change this state the valid user code has to be entered. The new state (active or not active) is valid after a period of 5 minutes (after touching the last button). The pre installed valid user code is 0001. In case of emergency there is a special code to break the unknown or forgotten user code. In that case enter code 2882 and the original pre installed code, 0001, is valid again.

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	 • Push button 1 (Menu). • Push button 3 (C). • Push button 1 (=>).  User code mode appears. • Push button A. The information for the user code shows. The user code can be activated or deactivated. • Enter the user code using button 1 (>>), 2 (+) and 3 (-). • Push button A.  • Push button 4 (Esc) for starting menu.

Changing the user code

1	Cabinet in work mode. See *§5.4 Starting up the cabinet on page 26.*	
2	Change the user code	• Push button 1 (Menu) and 3 (C). • Push 4x button 1 (=>). • Push button A.  • Enter actual user code. • Push button A.  • Enter the new valid user code. • Push button A.
The pre installed valid user code is 0001. In case of emergency there is a special code to break the unknown or forgotten user code. In that case enter code 2882 and the original pre installed code, 0001, is valid again.		

Appendix XI: Required specifications

Overview of the required specifications according to EN 12469:2000

	Requirement (shortened)	**According to:**	**Complied:**
Front aperture height	Between 160 and 250 [mm]	EN 12469 Annex A.1	Type test: Yes
Lighting	At least 750 [lux] at work surface	EN 12469 Annex A.2	Type test: Yes
Sound level	<65 [dB(A)] when background level is <55 [dB(A)] according to ISO11201.	EN 12469 Annex A.3	Type test: Yes
Sound level Buzzer	Exceed 10 [dB(A)] more than installation sound pressure	EN 12469 Annex A.3	Type test: Yes
Vibration	<0,005 [mm] RMS at centre workspace, Between 20 and 20000 [Hz]	EN 12469 Annex A.4	Type test: Yes
Stability	Conform to DIN EN 61010-1:2002-08 and EN 12100-1:2003 and 12100-2:2003	EN 12469 Annex A.5	Type test: Yes
Materials, general	The material likely to be in contact with micro organisms should be uniformly corrosion resistant, non-flammable and non-absorbing	EN 12469 Annex A.6	Type test: Yes
Materials, general	Materials and sealants for joints should be durable and resistant to cleaning and disinfection agents and resistant to general use of MSCs.	EN 12469 Annex A.6	Type test: Yes
Materials, general	Manufacturers should ensure that the materials of construction will not be damaged by fumigation with formaldehyde	EN 12469 Annex A.6	Type test: Yes
Glass and front windows	Laminated safety glass or UV-resistant safety plastics	EN 12469 Annex A.7	Type test: Yes
Glass and front windows	Conform to EN 12100-1:2003 and 12100-2:2003	EN 12469 Annex A.7	Type test: Yes
Electrical safety	Conform to EN 61010-1	EN 12469 Annex A.8	Type test: Yes
Gas supply (optional) safety	Conform to EN 12100-1:2003 and 12100-2:2003	EN 12469 Annex A.9	Type test: Yes
Gas supply (optional) safety	Gas supply should be controlled by a suitable valve that can be opened when the cabinet is running and that closes under any other conditions	EN 12469 Annex A.9	Type test: Yes
Ergonomics	Maintenance can be carried out safely on the cabinet after installation	EN 12469 Annex A.10	Type test: Yes
Ergonomics	Considered according to prEN ISO 14738:1997	EN 12469 Annex A.10	Type test: Yes
Temperature	Air temperature in work space <8° above ambient laboratory temperature	EN 12469 Annex A.11	Type test: Yes
Leakage of carcass	No visible leakage with soap-bubble test	EN 12469 Annex B	Type test: Yes
Retention efficiency	Microbiological test method or potassium iodide (KI) method	EN 12469 Annex C	Type test: Yes
Aerosol challenge method	Particle counter: <0,05% Aerosol photometer: <0,01%	EN 12469 Annex D	Installation test: Yes
Product protection	<300 CFU of B.subtilis	EN 12469 Annex E	Type test: Yes
Cross contamination		EN 12469 Annex F	Type test: Yes
Volumetric airflow rate		EN 12469 Annex G	Installation test: Yes
Design and airflow velocities		EN 12469 Annex H	Type test: Yes

Overview of the required specifications according to DIN 12980:2005

	Requirement (shortened)	**According to:**	**Complied:**
Lighting	At least 800 [lux]	DIN 12980 Chapter 11	Type test: Yes
Sound level	<60 [dB(A)] according to DIN 45635-1	DIN 12980 Chapter 12	Type test: Yes
Vibration	<0,005 [mm] RMS at centre workspace, Between 20 and 20000 [Hz]	DIN 12980 Chapter 12	Type test: Yes
Stability	Conform to DIN EN 61010-1:2002-08 and EN 12100-1:2003 and 12100-2:2003	DIN 12980 Chapter 7	Type test: Yes
Materials, general	The material likely to be in contact with cytotoxics should be uniformly corrosion resistant, non-flammable and cleanable	DIN 12980 Chapter 6	Type test: Yes
Materials, general	Materials and sealants for joints should be durable and resistant to cleaning and disinfection agents and resistant to general use of MSCs.	DIN 12980 Chapter 6	Type test: Yes
Materials, general	Manufacturers should ensure that the materials of construction will not be damaged by fumigation with formaldehyde	DIN 12980 Chapter 6	Type test: Yes
Glass and front windows	Laminated safety glass or UV-resistant safety plastics	DIN 12980 Chapter 6	Type test: Yes
Electrical safety	Conform to EN 61010-1	DIN 12980 Chapter 11	Type test: Yes
Ergonomics	Maintenance can be carried out safely on the cabinet after installation	DIN 12980 Chapter 9	Type test: Yes
Ergonomics	Considered according to prEN ISO 14738:1997	DIN 12980 Chapter 7	Type test: Yes
Temperature	Air temperature in work space <8° above ambient laboratory temperature	DIN 12980 Chapter 7	Type test: Yes
Leakage of carcass	No visible leakage with soap-bubble test	DIN 12980 Chapter 7 /EN 12469 Annex B	Type test: Yes
Retention efficiency	Microbiological test method or potassium iodide (KI) method	DIN 12980 Chapter 16 /EN 12469 Annex C2,C3	Type test: Yes
Aerosol challenge method	Particle counter: <0,05% locally counted Aerosol photometer: <0,01%	EN 12469 Annex D	Installation test: Yes
Product protection	<300 CFU of B.subtilis	DIN 12980 Chapter 17 /EN 12469 Annex E	Type test: Yes
Cross contamination		DIN 12980 Chapter 17 /EN 12469 Annex F	Type test: Yes
Volumetric airflow rate		DIN 12980 Chapter 15 or EN 12469 Annex G	Installation test: Yes
Design and airflow velocities		EN 12469 Annex H	Type test: Yes

An abstract of the Type test report can be sent on request by Clean Air Techniek B.V.

Appendix XII: Part list critical components

Component	Type specific	Art. no.	Manufacturer	Type
Downflow HEPA filter	EF(/B) 4	1001216	AAF	Astrocell A99C9S2R3L HEPA 12P6+ 610x1220x69 (mm) H14 acc. EN 1822
Exhaust HEPA filter	EF 4	1000404	AAF	Astrocell A99C9S2R3 HEPA 4P4 457X457X69 (mm) H14 acc. EN 1822
Exhaust HEPA filter	EF/B 4	1001406	AAF	Astrocell A99C9S2R3 HEPA 4P6 457x610x69 (mm) H14 acc. EN 1822
First HEPA filter	EF/B 4	1008027	SPX	HEPA V-pleats Type PB-H14 Nr. 1154.0110 H14 acc. EN 1822 (8 pieces)
Pre-filter	EF(/B) 4	1050001		G3 (EN 779)
Torsion-spring	EF(/B) 4	2700674	Coldwell	550mm, 22 kg
Fan	EF 4	3000033	EBM	D4E 225-CC-01, 230V, 50Hz, 650W, 2,84 A, 1150 min^{-1}, 25 µF
	EF/B 4	3000030	EBM	Ziehl Abegg RD28S-4EW.4R.AL 230 V +/- 10%, 50 Hz, P_1, 1,5 kW, 6,7 A, 1150 rpm, 25 µF/400 V, 40 °C, 26 kg
Gas spring	EF(/B) 4	2702006	ACP	150mm, 250N
FL-lighting	EF(/B) 4	1440016	Osram	Lumilux L36W/21-01
Ballast	EF(/B) 4	1240002	Osram	VSA 40 W Optima
Downflow HEPA filter	EF 5	1001516	AAF	Astrocell A99C9S2R3L 15P6 610X1524X69 (mm) H14 acc. EN 1822
Exhaust HEPA filter	EF 5	1000606	AAF	Astrocell A99C9S2R3 6P6 610X610X69 (mm) H14 acc. EN 1822
Pre-filter	EF 5	1050001		G3 (EN 779)
Torsion-spring	EF 5	2700675	Coldwell	400mm, 26 kg
Fan	EF 5	3000002	Ziehl Abegg	RD25S-4EW.4N.1L (1 piece), 230 V +/- 10%, 50 Hz, P_1, 0,93 kW, 4,0 A, 1150 rpm, 12 µF/400 V, 50 °C, 18 kg
Gas spring	EF 5	2702008	ACP	150mm, 300N
FL-lighting	EF 5	1440019	Osram	Lumilux L36W/21
Ballast	EF 5	1240002	Osram	VSA 40 W Optima
Downflow HEPA filter	EF(/B) 6	1001816	AAF	Astrocell A99C9S2R3L HEPA 18P6+ 610x1830x69 (mm) H14 acc. EN 1822
Exhaust HEPA filter	EF(/B) 6	1000607	AAF	Astrocell A99C9S2R3 HEPA 7P6 762x610x69 (mm) H14 acc. EN 1822
First HEPA filter	EF/B 6	1008027	SPX	HEPA V-pleats Type PB-H14 Nr. 1154.0110 H14 acc. EN 1822 (12 pieces)
Pre-filter	EF(/B) 6	1050001		G3 (EN 779)
Torsion-spring	EF(/B) 6	2700676	Coldwell	400mm, 32kg
Fan	EF 6	3000002	Ziehl Abegg	RD25S-4EW.4N.1L (1 piece), 230 V +/- 10%, 50 Hz, P_1, 0,93 kW, 4,0 A, 1150 rpm, 12 µF/400 V, 50 °C, 18 kg
	EF(/B) 6	3000002	Ziehl Abegg	RD25S-4EW.4N.1L (2 pieces), 230 V +/- 10%, 50 Hz, P_1, 0,93 kW, 4,0 A, 1150 rpm, 12 µF/400 V, 50 °C, 18 kg
Gas spring	EF(/B) 6	2702003	ACP	150mm, 325N
FL-lighting	EF(/B) 6	1440017	Osram	Lumilux L58W/21
Ballast	EF(/B) 6	1240001	Osram	VSA 40 W Optima

Component	Type specific	Art. no.	Supplier	Type
Air velocity-sensor downflow	All	1330023	Kriwan	0,2-1 m/s
Air velocity-sensor exhaust (=inflow)	All	1330010	Kriwan	0,2-10 m/s
FL-holder	All	1440110	BJB	BJB G13
Starters	All	2040001	Philips	PH starter S10, 220-240V, 4-65W
Miniature-switch	All	63001P1	Omron	SS-5GL2
Main filter	All	6400010	Acrotronics	F.BK.D-.3940.ZG, 10A
PCB-material	All	-	Duraver	FR-4, according to UL94
Socket	All	Misc.	e.g. Mennekes Schuko	-
Optional:				
Gas-/vacuum tap	All	2800013/2800048	Broen	1770
Gas valve	All	2820012	Bürkert	0-25[Bar] 2/2-way valve, normally closed, 24[V]
Bunsenburner	All	Misc.	Clean Air	1 SCS Lumos II 9V or Fuego

Articles mentioned above can be ordered at the service organization Particle Measurement & Validation b.v.

Particle Measurement & Validation b.v.
Kuipersweg 37
3449 JA Woerden
The Netherlands

Phone: +31 (0) 348 423661
Fax: +31 (0) 348 422684
E-mail: info@pmvbv.nl
Internet: www.pmvbv.nl

Appendix XIII: Short user manuals

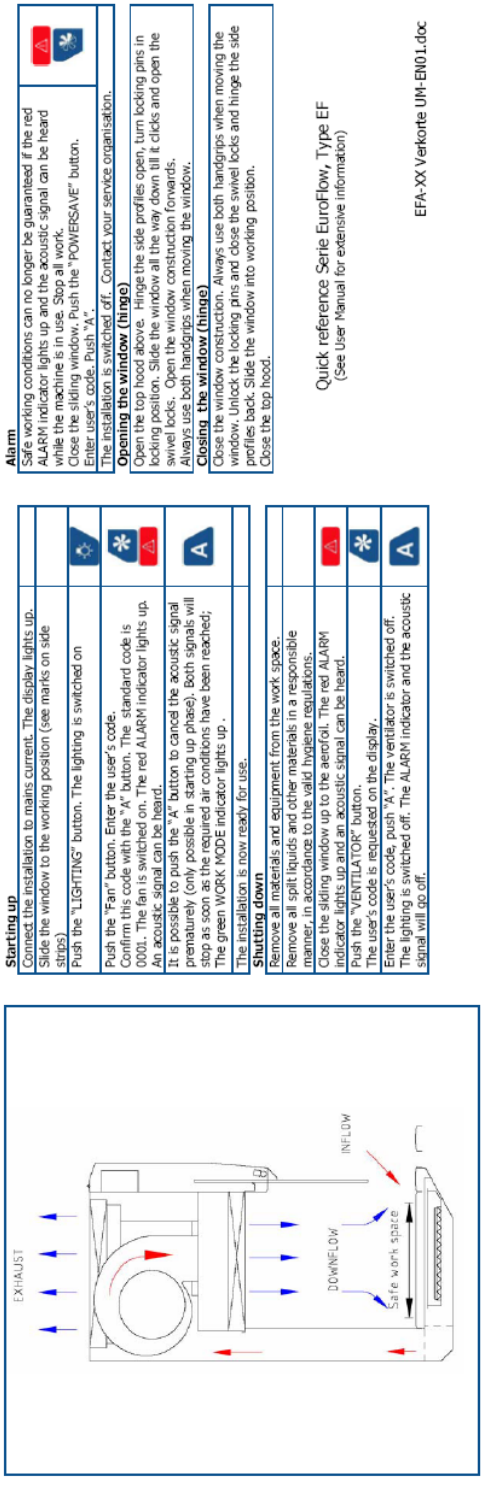

Alarm
Safe working conditions can no longer be guaranteed if the red ALARM indicator lights up and the acoustic signal can be heard while the machine is in use. Stop all work.
Close the sliding window. Push the "POWERSAVE" button.
Enter user's code. Push "A".
The installation is switched off. Contact your service organisation.
Opening the window (hinge)
Open the top hood above. Hinge the side profiles open, turn locking pins in locking position. Slide the window all the way down till it clicks and open the swivel locks. Open the window construction forwards.
Always use both handgrips when moving the window.
Closing the window (hinge)
Close the window construction. Always use both handgrips when moving the window. Unlock the locking pins and close the swivel locks and hinge the side profiles back. Slide the window into working position.
Close the top hood.
Quick reference Serie EuroFlow, Type EF
(See User Manual for extensive information)
EFA-XX Verkorte UM-EN01.doc
Starting up
Connect the installation to mains current. The display lights up.
Slide the window to the working position (see marks on side strips)
Push the "LIGHTING" button. The lighting is switched on
Push the "Fan" button. Enter the user's code.
Confirm this code with the "A" button. The standard code is 0001. The fan is switched on. The red ALARM indicator lights up.
An acoustic signal can be heard.
It is possible to push the "A" button to cancel the acoustic signal prematurely (only possible in starting up phase). Both signals will stop as soon as the required air conditions have been reached;
The green WORK MODE indicator lights up .
The installation is now ready for use.
Shutting down
Remove all materials and equipment from the work space.
Remove all spilt liquids and other materials in a responsible manner, in accordance to the valid hygiene regulations.
Close the sliding window up to the aerofoil. The red ALARM indicator lights up and an acoustic signal can be heard.
Push the "VENTILATOR" button.
The user's code is requested on the display.
Enter the user's code, push "A". The ventilator is switched off.
The lighting is switched off. The ALARM indicator and the acoustic signal will go off.
EXHAUST
DOWNFLOW
INFLOW
Safe work space

Figure 49 Short user manual EF-series

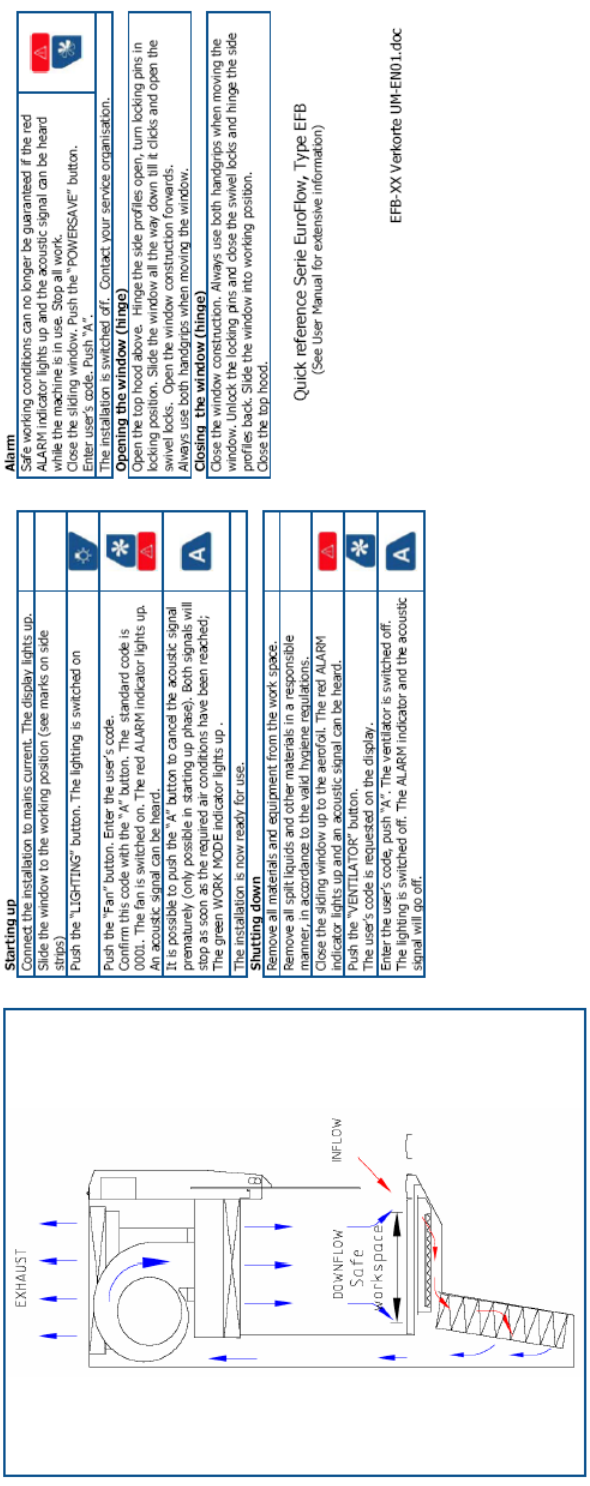

Alarm
Safe working conditions can no longer be guaranteed if the red ALARM indicator lights up and the acoustic signal can be heard while the machine is in use. Stop all work.
Close the sliding window. Push the "POWERSAVE" button.
Enter user's code. Push "A".
The installation is switched off. Contact your service organisation.
Opening the window (hinge)
Open the top hood above. Hinge the side profiles open, turn locking pins in locking position. Slide the window all the way down till it clicks and open the swivel locks. Open the window construction forwards.
Always use both handgrips when moving the window.
Closing the window (hinge)
Close the window construction. Always use both handgrips when moving the window. Unlock the locking pins and close the swivel locks and hinge the side profiles back. Slide the window into working position.
Close the top hood.
Quick reference Serie EuroFlow, Type EFB
(See User Manual for extensive information)
EFB-XX Verkorte UM-EN01.doc
Starting up
Connect the installation to mains current. The display lights up.
Slide the window to the working position (see marks on side strips)
Push the "LIGHTING" button. The lighting is switched on
Push the "Fan" button. Enter the user's code.
Confirm this code with the "A" button. The standard code is 0001. The fan is switched on. The red ALARM indicator lights up.
An acoustic signal can be heard.
It is possible to push the "A" button to cancel the acoustic signal prematurely (only possible in starting up phase). Both signals will stop as soon as the required air conditions have been reached;
The green WORK MODE indicator lights up .
The installation is now ready for use.
Shutting down
Remove all materials and equipment from the work space.
Remove all spilt liquids and other materials in a responsible manner, in accordance to the valid hygiene regulations.
Close the sliding window up to the aerofoil. The red ALARM indicator lights up and an acoustic signal can be heard.
Push the "VENTILATOR" button.
The user's code is requested on the display.
Enter the user's code, push "A". The ventilator is switched off.
The lighting is switched off. The ALARM indicator and the acoustic signal will go off.
EXHAUST
DOWNFLOW
Safe
workspace
INFLOW

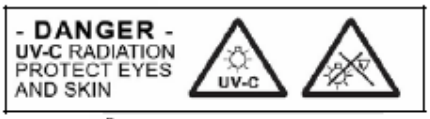
Figure 50 Short manual EF/B-series

Appendix XIV: TUV Low Pressure Mercury Lamps

Special fluorescent lamps

Disinfection

Philips TUV disinfection lamps are low-pressure mercury-vapour discharge lamps consisting of a tubular glass envelope, emitting short-wave ultraviolet radiation with a radiation peak at 253.7 nm (UV-C) for germicidal action. The glass filters out the 185 nm ozone-forming line. A protective coating on the inside limits the depreciation of the useful UV-C radiation output (Longlife lamps). PL-S have a specially adapted starter providing almost instant starting characteristics already built into the lamp base. Note The UV-C radiation output of these lamps is indicated by the following warning signs



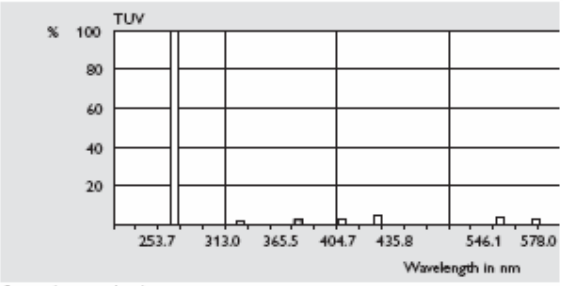
Applications

Philips TUV lamps are used for killing or inactivating bacteria, viruses and other primitive organisms. Typical application examples include air, water and surface disinfection in hospitals, bacteriological research and pharmaceutical institutions, and food processing industries, such as dairies, breweries and bakeries. They are also used for the disinfection of drinking water, waste water, swimming pools, air conditioning systems, cold storage rooms, packing material, etc. Finally, they are applied in a variety of photochemical processes.

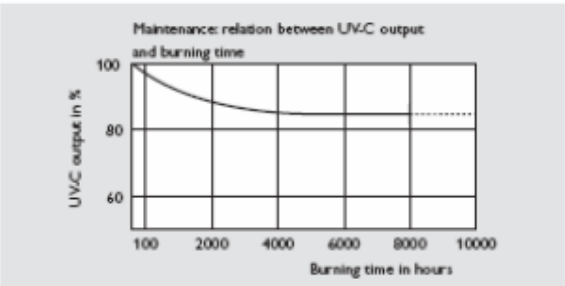
Note: Radiation of these lamps is harmful to eyes and skin. Installations with these lamps are to be screened off completely.

Dimensions in mm

Type		Cap/ base	Lamp voltage V	Lamp current A	UV-C radiation W	Useful life h	Depreciation 5000 hrs %	Nett weight g
TUV								
TUV 4W		G5	29	0.17	0.7	5000	30	16
TUV 6W		G5	42	0.16	1.5	8000	25	22
TUV 8W		G5	56	0.15	2.1	8000	20	29
TUV 11W		G5	37	0.33	2.1	8000	25	22
TUV 16W		G5	46	0.35	3.4	8000	20	29
TUV 10W		G13	45	0.23	2.5	8000	10	62
TUV 15W		G13	51	0.34	4.6	8000	12	75
TUV 25W		G13	46	0.60	7.0	8000	12	75
TUV 30W		G13	100	0.37	11.2	8000	12	140
TUV 36W		G13	103	0.44	14.6	8000	12	186
TUV 55W	HO	G13	83	0.77	16.5	8000	12	140
TUV 75W	HO	G13	108	0.84	25.5	8000	12	140
TUV 115W	VHO	G13	92	1.50	37.7	5000	12	290
TUV 115W	-R VHO	G13	92	1.50	31.0	5000	15	293
TUV PL-S								
TUV 5W	PL-S	G23	34	0.18	1.0	8000	15	30
TUV 9W	PL-S	G23	60	0.17	2.4	8000	15	41
TUV 11W	PL-S	G23	89	0.16	3.6	8000	15	58
TUV PL-L								
TUV 18W	PL-L	2G11	60	0.37	5.5	8000	15	66
TUV 36W	PL-L	2G11	105	0.44	12.0	8000	15	114
TUV 55W HF	PL-L	2G11	103	0.54	17.0	8000	15	145



Spectral power distribution



Appendix XV: Statement of the agreement for machines

Manufacturer: Clean Air Techniek B.V.

Address: Kuipersweg 37
3449 JA Woerden
The Netherlands
Phone: +31 (0) 348 411114
Fax: +31 (0) 348 422684
E-mail: info@cleanair.eu
Internet: www.cleanair.eu

Hereby declares that:

Type: _____
Project number: _____
Serial number: _____

is in compliance with the following directives:
- Machine Directive (2006/42/EC);
- Low Voltage Directive (2006/95/EC);
- Electromagnetic Compatibility Directive (2004/108/EC).

And declares furthermore that the following national technical standards and specifications are used:
- NEN-EN 12469 (2000) Performance criteria for microbiological safety cabinets;
- NEN-EN 1822 High efficiency particulate air filters;
- DIN 12980:2005 Zytostatika-Werkbänke (additional national technical standard only for EF/B 4 and EF/B 6).

Signature:

.....

Name: .....

Quality controller
By order of the production controller

Woerden, date .....

Appendix XVI: Memo

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